



FRIDAY, JUNE 30, 1876.

### Hydraulic Lift for Raising Locomotives.

One of the great sources of expense attending the construction of heavy machinery is the cost of moving it. Every facility, therefore, which will make it possible to move it with greater ease diminishes the cost of construction. Our engravings represent a very convenient and effective arrangement for raising and lowering locomotives, which was designed by Mr. Frank D. Child and constructed for the Hinkley Locomotive

speaking trumpet are connected with it, so that the persons below can give directions to those above who are operating the pumps. The whole arrangement is admirably designed, and works very satisfactorily.

### Contributions.

#### Efficiency of Duty in Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The tone in which this discussion is conducted by yourself and others, has satisfied the writer as to the correctness of his original position. This paper will end the matter, so far as he is concerned. Talking and writing are of course cheap and cost nothing.

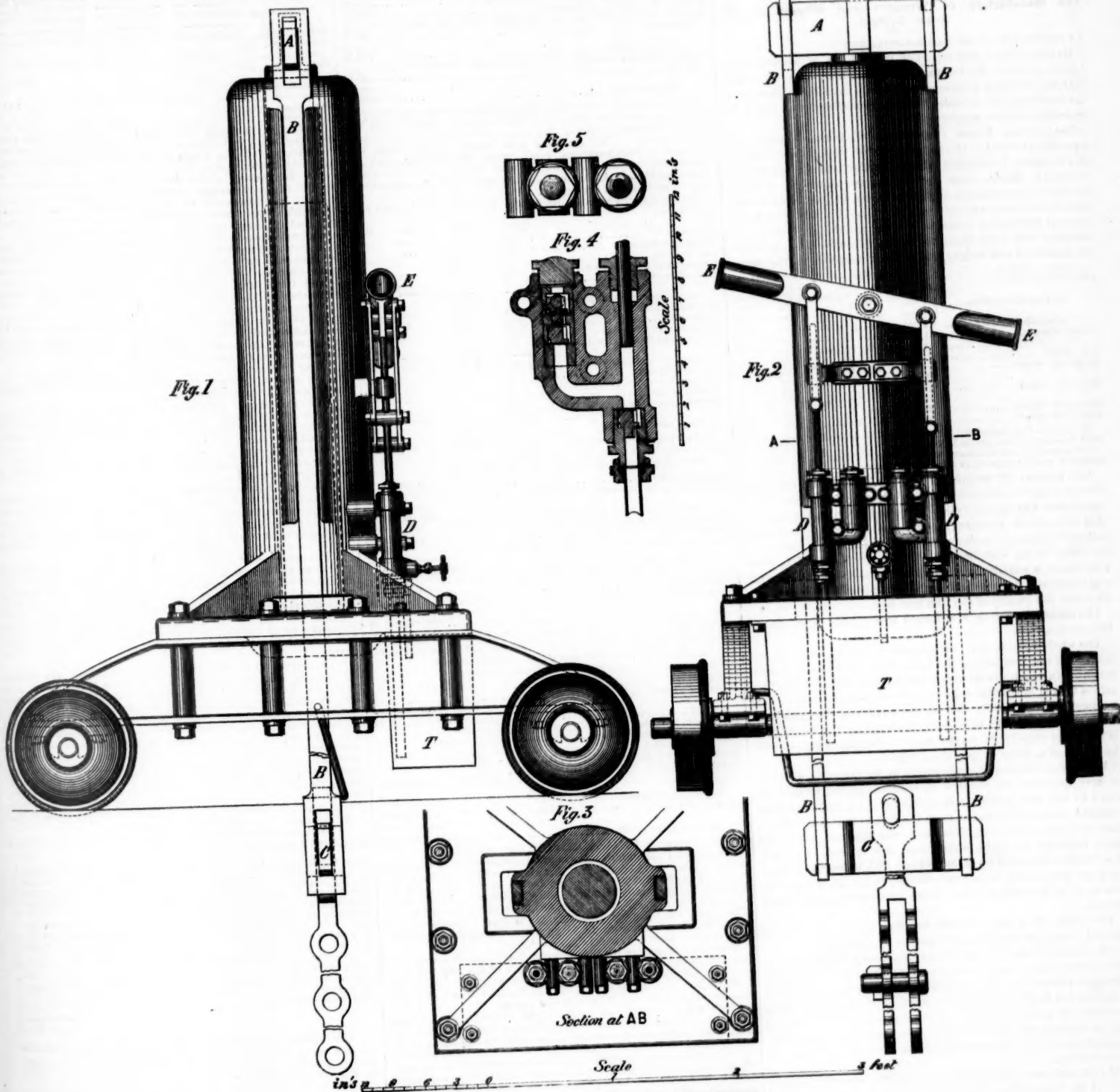
The items of loss enumerated, to which so much exception is taken, are those of scientists who have investigated the ques-

gether, and both were attached to the same machinery. Both cylinders were the same bore and stroke, yet the Harris Corliss indicated 150 horse power, the other but 100. The former was run with two boilers, burning 3,146 pounds of coal a day to roll 253 plates of metal. The other engine could not be used at all till the third boiler was added, when 5,408 pounds of coal were consumed in rolling 175 of the same sort of plates. Now was there any loss or not?

The fact is, there is as much difference between the large engine in the Centennial Exposition and the best slide valve that could be made, as there is between sunlight and moonshine.

Numerous similar trials have been made by the writer, more than eighty altogether, on slide-valve engines, changing nothing but the style of valve, which satisfy him that fully 50 per cent. loss is understating the actual average of the best engines.

Prior to 1834, nearly all the engines used in the Western



HYDRAULIC LIFT FOR RAISING LOCOMOTIVES.

Designed by Mr. Frank D. Child, Superintendent of the Hinkley Locomotive Works, Boston.

Works, of which he is Superintendent. It consists of a hydraulic ram mounted on two pairs of wheels, which run on a track on the floor of the erecting shop of that establishment. The piston or plunger is 5 in. in diameter, and works into the upper end of a heavy cast-iron cylinder, and has a stroke of 40 inches. To the upper end a cross-head, A, figs. 1 and 2, is attached, which has a pair of rods or bars, B B, that extend down on each side of the cylinder and below the floor. Their lower ends support a cross-tail, C, to which a clevis or suitable links are attached. A pair of hydraulic pumps, D D, are placed alongside the cylinder, and are worked by a lever, which can be lengthened out by suitable arms in- serted into the sockets in the ends. The pump is also represented on a larger scale in section and plan in figs. 4 and 5. A suitable tank, T, is carried on the vehicle which supports the ram, and a signalling apparatus and an india-rubber tube

tion—not mine. "Loss by excess of heat in the exhaust steam, 50 per cent.," is more than all the rest put together. Perhaps the language actually used, in haste, without expecting the carping criticism to which it has been subjected, was not grammatically, scientifically or mechanically accurate and correct. If so, the writer apologises for his carelessness.

Mr. K. asks for the loss of power by the use of the slide valve. Doubtless he, with many others, will deny that there is any loss at all.

In a pamphlet published in 1870, by W. A. Harris, Providence, R. I., builder of Harris' Corliss Engines, is given the results of a competitive trial made in 1863 at the Meriden, Conn., Britannia Co.'s Works, between the two styles of engine.

Both were to be managed by their builders, and to run week about. Each was attached to the same battery of these boilers, one of which was so arranged that it could be detached alto-

gether, and both were attached to the same machinery. Both cylinders were the same bore and stroke, yet the Harris Corliss indicated 150 horse power, the other but 100. The former was run with two boilers, burning 3,146 pounds of coal a day to roll 253 plates of metal. The other engine could not be used at all till the third boiler was added, when 5,408 pounds of coal were consumed in rolling 175 of the same sort of plates. Now was there any loss or not?

The introduction of the poppet valve changed all this, though it was as violently opposed then by conservative engineers as any proposed change to locomotives is now. At present not a slide-valve engine can be seen on a boat of any size. The present river engine has been improved till it is a most splendid and powerful machine, having five cylinders instead of one, and the boats can be put through the swiftest water with ease.

When it comes out at a Master Mechanics' Convention that 11½ per cent. more than one-ninth of the coal in weight, and one-fourth in bulk, that is pitched into locomotive furnace doors is instantly dashed through the flues, tearing them to







Branch authorized at the last annual meeting were completed, to Oskaloosa, and the rest, to Knoxville, is under contract to be completed about Sept. 1. The report continues:

"For the information of stockholders not familiar with the State of Iowa it is proper to state that the portion of your road known as the Oskaloosa Branch diverges from the main or Council Bluffs line at Wilton, 25 miles west of the Mississippi River, running southerly to Muscatine, an important town situated on the same river; thence westerly through Louisa, Washington, Keokuk, and Mahaska counties to Oskaloosa, the present terminus, 103 miles from Wilton.

"These counties are well settled, and take rank with the most productive and prosperous counties in the State of Iowa. Marion County, next reached by the extension to Knoxville, is equally rich in agricultural products, and with Mahaska County contains an almost inexhaustible supply of coal, of a superior quality. As the bulk of the agricultural products of this rich territory must seek a market in Chicago, or further East, using your line for more than 300 miles, which with the traffic in coal that is sure to spring up, when the supply is known to be abundant and cheap, it is evident this extension must add largely to the transportation of your road, and result in an increase of the net income.

"A further extension of 24 miles west from Knoxville will connect with the Indianapolis Branch Railroad, and thus give a Western connection with your main line, via Des Moines.

"With this connection complete, your company would have two parallel roads from Wilton to Des Moines, passing centrally through two adjacent tiers of counties, and they could be used to give the relief usually obtained by building a second track.

"The principal items of expenditures for repairs and renewals of track have been as follows:

287,926 cross ties, costing.....	\$82,587 99
6,243 gross tons of steel rails.....	455,865 85
1,175 gross tons of iron rails.....	58,912 63
355,775 lbs. railroad spikes.....	7,724 70
538,022 lbs. joint spikes and bolts.....	15,382 47
49,593 rails have been cut and repaired in company's shops at a cost of.....	23,468 36

66.2 miles of track have been relaid with steel.

13.4 miles of track have been relaid with new iron.

"Steel rails have been used altogether in the renewal of main line track for the past year, and iron rails for second track and branches. The entire cost of steel rails used during the year has been charged to operating expenses.

"The heavy rains in the latter part of winter and spring caused many slides that filled ditches, and in some instances obstructed travel for a short time. With this exception the roadbed and track have been maintained in excellent condition."

"It is believed that but slight, if any, additions to the cars will be needed the coming year to meet the requirements of the road."

## TRAFFIC AND EARNINGS.

### Railroad Earnings.

Earnings for various periods are reported as follows:

Year ending May 31:	1875-76.	1874-75.	Inc. or Dec.	P. c.
Michigan Central.....	\$6,850,964	\$7,102,286	Dec. \$251,322	3.5
Expenses.....	4,802,962	5,068,097	Dec. 265,135	5.2
Net earnings.....	\$2,048,002	\$2,034,189	Inc. \$13,813	0.7
Earnings per mile.....	8,521	8,834	Dec. 313	3.5
Per cent. of expenses.....	70.11	71.35	Dec. 1.24	1.7

Five months ending May 31:	1876.	1875.	Inc. or Dec.	P. c.
Louisville, Cin. & Lex'n.....	\$415,008	.....	.....	.....
Nashville, Chattanooga & St. Louis.....	758,092	\$661,705	Inc. \$96,387	14.6
Expenses.....	466,963	475,329	Dec. 8,366	1.8
Net earnings.....	\$291,109	\$186,376	Inc. \$104,733	56.2
Per cent. of expenses.....	61.61	71.83	Dec. 10.22	14.2
St. Paul & Sioux City.....	208,190	155,028	Inc. \$53,162	34.3
Expenses.....	149,971	.....	.....	.....
Net earnings.....	\$58,219	.....	.....	.....
Per cent. of expenses.....	72.03	.....	.....	.....
St. Paul & Sioux City.....	190,308	\$61,555	Inc. \$128,753	59.6
Expenses.....	109,203	.....	.....	.....
Net earnings.....	\$81,105	.....	.....	.....
Per cent. of expenses.....	83.74	.....	.....	.....

Two months ending May 31:	1876.	1875.	Inc. or Dec.	P. c.
Nevada County.....	\$12,845	.....	.....	.....
Expenses.....	5,382	.....	.....	.....
Net earnings.....	\$7,463	.....	.....	.....
Earnings per mile.....	571	.....	.....	.....
Per cent. of expenses.....	41.90	.....	.....	.....

Month of May:	1876.	1875.	Inc. or Dec.	P. c.
Kansas Pacific.....	\$247,602	\$254,202	Dec. \$6,600	2.6
Expenses.....	139,390	.....	.....	.....
Net earnings.....	\$108,212	.....	.....	.....
Per cent. of expenses.....	56.29	.....	.....	.....
Louisville, Cin. & Lex'n.....	91,859	\$92,569	Dec. \$701	0.8
Expenses.....	63,316	66,948	Dec. 3,632	5.4
Net earnings.....	\$28,543	\$25,621	Inc. \$2,922	11.4
Per cent. of expenses.....	68.90	72.30	Dec. 3.40	4.7

Second week in June:	1876.	1875.	Inc. or Dec.	P. c.
Denver & Rio Grande.....	\$8,051	\$9,175	Dec. \$1,124	12.2
Main Line.....	.....	.....	.....	.....
Denver & Rio Grande.....	2,106	.....	.....	.....
Trinidad Division.....	.....	.....	.....	.....
St. Louis, Iron Mt. & Southern.....	66,960	78,856	Dec. 11,896	14.0

Third week in June:	1876.	1875.	Inc. or Dec.	P. c.
Chi., Mil. & St. Paul.....	\$204,000	\$182,178	Inc. \$21,822	12.0

Fourth week in June:	1876.	1875.	Inc. or Dec.	P. c.
Chi., Mil. & St. Paul.....	\$204,000	\$182,178	Inc. \$21,822	12.0

### Petroleum Movement.

The following shipments from the Pennsylvania oil region are reported for May:

To	Barrels.
To Pittsburgh by Allegheny River.....	41,997
" " Allegheny Valley R. R.....	34,886
" " Conduit Co.'s pipe line.....	72,200
By Dunkirk, Warren & Allegheny Valley R. R.....	113,700
By Lake Shore & Michigan Southern Ry. and from Harrisville.....	113,700
By Atlantic & Great Western.....	60,502
By Pittsburgh, Titusville & Buffalo and other lines to points other than Pittsburgh.....	191,310
Total.....	596,997

Total in May, 1875, 633,474 barrels, showing a decrease this year of 36,477 barrels, or 5.8 per cent. The total shipments for the five months ending May 31 were: 1876, 2,924,979; 1875, 2,886,880; increase, 38,099 barrels, or 1.3 per cent.

### Ocean Freight.

Rates from New York during the past week have ranged as follows: To Liverpool by s.s. 1-cotton, 9-32d. per pound; grain per bushel 7d. to 7½d.; tobacco, 35s. per hoghead; by steam, cotton 5-16d., cheese at 55s. per ton, bacon 40s., grain 8½d. per bushel. By sail to Cork for orders, grain was taken from New York at 9½d. to 9¾d. per bushel; from Baltimore at 9½d. and 10½d.; from Philadelphia at 9½d. Petroleum charters were numerous, closing Tuesday at 4s. 6d. per barrel from New York

## RAILROAD EARNINGS IN MAY.

Name of Road.	Mileage.					Earnings.					Earnings per mile.				
	1876.	1875.	Inc.	Dec.	P. c.	1876.	1875.	Increase.	Decrease.	P. c.	1876.	1875.	Inc.	Dec.	P. c.
Atchison, Topeka & Santa Fe.....	711	508	203	.....	40.2	\$212,083	\$106,482	\$105,601	.....	99.2	\$298	\$210	88	.....	41.9
Atlantic & Pacific.....	328	3 8	.....	.....	.....	99,60	99,895	5,700	.....	6.1	9-4	966	.....	.....	.....
Baltimore & Ohio.....	1,462	1,462	.....	.....	.....	1,363,694	1,414,972	51,278	.....	3.6	933	968	.....	.....	.....
Cairo & St. Louis.....	146	146	.....	.....	.....	23,208	27,104	3,896	.....	14.4	170	186	.....	.....	.....
Canada Southern.....	452	452	.....	.....	.....	123,088	102,546	20,542	.....	20.0	272	227	.....	.....	.....
Central Pacific.....	1,316	1,293	22	.....	1.7	1,700,000	1,798,468	98,468	.....	5.5	1,293	1,391	.....	.....	.....
Chicago & Alton.....	650	650	.....	.....	.....	432,926	351,004	81,922	.....	23.3	666	540	.....	.....	.....
Chicago, Milwaukee & St. Paul.....	1,400	1,399	1	.....	.....	819,833	718,466	101,367	.....	14.1	586	514	.....	.....	.....
Cincinnati, Lafayette & Chicago.....	75	75	.....	.....	.....	28,762	30,908	2,146	.....	7.0	384	412	.....	.....	.....
Denver & Rio Grande.....	120	120	.....	.....	.....	34,864	35,630	766	.....	2.2	291	297	.....	.....	.....
Flint & Pere Marquette.....	281	281	.....	.....	.....	90,162	88,710	1,452	.....	1.6	321	316	.....	.....	.....
Hannibal & St. Joseph.....	296	296	.....	.....	.....	136,394	125,800	10,594	.....	8.3	461	425	.....	.....	.....
Illinois Central.....	1,109	1,109	.....	.....	.....	585,909	604,881	18,972	.....	3.1	528	545	.....	.....	.....
Indianapolis, Bloomington & Western.....	344	344	.....	.....	.....	130,585	89,694	40,891	.....	45.6	380	261	.....	.....	.....
International & Great Northern.....	459	459	.....	.....	.....	72,837	81,595	8,758	.....	10.7	150	178	.....	.....	.....
Kansas Pacific.....	784	784	.....	.....	3.0	247,602	254,202	6,600	.....	16.8	316	387	.....	.....	.....
Louisville, Cincinnati & Lexington.....	231	231	.....	.....	.....	91,859	92,569	710	.....	0.8	396	401	.....	.....	.....
Michigan Central.....	804	804	.....	.....	.....	629,348	566,789	62,559	.....	13.0	783	695	.....	.....	.....
Missouri, Kansas & Texas.....	786	786	.....	.....	.....	122,928	187,091	64,163	.....	52.3	271	238	.....	.....	.....
Nashville, Chattanooga & St. Louis.....	342	342	.....	.....	.....	143,492	106,967	36,525	.....	34.1	419	313	.....	.....	.....
New Jersey Midland.....	86	86	.....	.....	.....	52,073	31,165	20,908	.....	67.0	606	362	.....	.....	.....
Ohio & Mississippi.....	615	615	.....	.....	.....	313,070	257,971	55,099	.....	21.4	509	419	.....	.....	.....
Pacific, of Missouri.....	426	426	.....	.....	.....	264,817	212,331	52,486	.....	19.1	622	522	.....	.....	.....
Paducah & Memphis.....	115	115	.....	.....	.....	14,943	16,387	1,444	.....	8.8	130	142	.....	.....	.....
Philadelphia & Erie.....	288	288	.....	.....	.....	298,485	266,125	32,360	.....	12.2	1,036	924	.....	.....	.....
St. Louis, Alton & Terre Haute.....	71	71	.....	.....	.....	38,920	39,039	119	.....	0.3	548	550	.....	.....	.....
St. Louis, Iron Mountain & Southern.....	685	685	.....	.....	.....	264,900	275,147	10,247	.....	3.4	387	402	.....	.....	.....
St. Louis, Kansas City & Northern.....	504	504	.....	.....	.....	237,355	188,083	49,272	.....	26.2	471	373	.....	.....	.....
St. Louis & Southeastern.....	349	349	.....	.....	.....	87,896	73,724	14,172	.....	19.2	253	211	.....	.....	.....
St. Paul & Sioux City.....	122	122	.....	.....	.....	46,442	47,795	1,353	.....	2.9	381	392	.....	.....	.....
Sioux City & St. Paul.....	148	148	.....	.....	.....	37,775	25,427	12,348	.....	9.4	188	172	.....	.....	.....
Toledo, Peoria & Warsaw.....	237	237	.....	.....	.....	125,200	70,692	54,508	.....	77.4	528	298	.....	.....	.....
Totals.....	15,741	15,492	249	.....	.....	\$8,951,110	\$8,421,648	\$529,462	.....	6.3	\$560	\$544	.....	.....	.....
Total increase.....	.....	.....	249	.....	1.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

## RAILROAD EARNINGS, FIVE MONTHS ENDING MAY 31.

Name of Road.	Mileage.					Earnings.					Earnings per mile.				
	1876.	1875.	Inc.	Dec.	P. c.	1876.	1875.	Increase.	Decrease	P. c.	1876.	1875.	Inc.	Dec.	P. c.
Atchison, Topeka & Santa Fe...	678	508	170	...	33.5	\$852,834	\$468,754	\$384,080	...	81.9	\$1,258	\$923	\$335	...	36.3
Atlantic & Pacific.....	328	328	...	...	...	504,698	465,651	39,047	...	8.4	1,539	1,430	110	...	8.4
Cairo & St. Louis.....	146	129	18	...	14.1	100,082	97,807	2,275	...	2.3	686	765	...	\$80	10
Canada Southern.....	452	452	...	...	...	721,873	421,350	300,523	...	71.3	1,597	932	665	...	71.3
Central Pacific.....	1,315	1,293	22	...	1.7	6,262,000	6,171,813	90,187	...	1.5	4,762	4,773	...	11	0
Chicago & Alton.....	650	650	...	...	...	1,794,431	1,730,733	63,698	...	3.7	2,761	2,663	98	...	3.7
Chicago, Milwaukee & St. Paul.....	1,400	1,399	1	...	...	3,083,185	2,650,273	432,912	...	16.3	2,302	1,904	398	...	16.3
Cincinnati, Lafayette & Chicago.....	75	75	...	...	...	150,100	155,247	5,147	...	3.4	2,121	2,070	51	...	3.4
Denver & Rio Grande.....	120	120	...	...	...	162,569	138,316	24,253	...	17.5	1,355	1,189	166	...	17.5
Hannibal & St. Joseph.....	296	296	...	...	...	758,381	62,926	135,455	...	31.7	2,562	2,104	458	...	31.7
Illinois Central.....	1,109	1,109	...	...	...	2,934,117	2,883,571	50,546	...	1.8	2,646	2,600	46	...	1.8
Indianapolis, Bloom. & West'n.....	344	344	...	...	...	640,441	516,249	125,192	...	24.3	1,862	1,498	364	...	24.3
International & Gt. Northern.....	459	459	...	...	...	504,689	514,722	...	\$10,053	2.0	1,099	1,171	...	29	2
Kansas Pacific.....	770	761	9	...	1.2	1,123,065	1,214,881	...	91,216	7.5	1,699	1,696	...	137	8
Michigan Central.....	804	804	...	...	...	2,932,314	2,70,091	221,723	...	8.2	3,647	3,371	276	...	8.2
Missouri, Kansas & Texas.....	786	786	...	...	...	1,184,712	1,007,571	177,141	...	17.6	1,507	1,282	225	...	17.6
Nashville, Chattanooga & St. L.....	342	342	...	...	...	768,074	661,706	96,368	...	14.6	2,217	1,936	282	...	14.6
Ohio & Mississippi.....	615	532	89	...	16.9	1,542,923	1,392,222	210,631	...	15.8	2,362	2,383	...	24	0
Pacific, of Missouri.....	426	426	...	...	...	1,448,802	1,175,119	275,083	...	23.4	3,401	2,785	616	...	23.4
Paducah & Memphis.....	115	115	...	...	...	91,683	79,254	12,429	...	15.7	797	689	108	...	15.7
Philadelphia & Erie.....	288	288	...	...	...	1,304,456	1,175,213	129,243	...	11.0	4,820	4,081	739	...	11.0
St. Louis, Alton & Terre Haute, Main Line.....	195	195	...	...	...	485,283	409,881	75,402	...	18.4	2,480	2,102	378	...	18.4
St. Louis, Alton & Terre Haute, Belleville Line.....	71	71	...	...	...	196,894	241,771	...	44,877	18.6	2,773	3,406	...	632	18
St. Louis, Iron Mt. & Southern.....	665	665	...	...	...	1,474,305	1,348,318	125,987	...	9.3	2,152	1,968	185	...	9.3
St. Louis, Kansas City & North'n.....	504	504	...	...	...	1,371,565	1,057,009	214,556	...	20.3	3,232	2,097	1,135	...	20.3
St. Louis & Southeastern.....	349	349	...	...	...	416,993	414,182	2,811	...	0.7	1,196	1,196	0	...	0.7
St. Paul & Sioux City.....	122	122	...	...	...	209,190	185,092	24,098	...	12.2	1,706	1,371	335	...	12.2
Sioux City & St. Paul.....	148	148	...	...	...	130,448	81,554	48,894	...	59.9	891	551	340	...	59.9
Toledo, Peoria & Warsaw.....	237	237	...	...	...	557,437	331,452	225,985	...	68.6	2,352	1,493	859	...	68.6
Totals.....	13,829	13,520	309	...	2.3	33,606,111	30,250,894	\$3,501,333	\$146,146	11.1	\$2,430	\$2,237	\$193	...	8.8
Total increase.....			309	...	2.3			3,355,217						...	





Published Every Saturday.

CONDUCTED BY

S. WRIGHT DUNNING AND M. N. FORNEY.

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## Editorial Announcements.

**Passes.**—All persons connected with this paper are forbidden to ask for notice under any circumstances, and we will be thankful to have any act of the kind reported to this office.

**Addresses.**—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

## COMPETITION AND COMBINATION.

This, substantially, is the subject of the third paper by Mr. Charles Francis Adams, Jr., on the "State and the Railroads," published in the *Atlantic Monthly* for July. We have spoken of it heretofore as a remarkable paper, sure to attract attention. Perhaps it is not so remarkable in itself as in consideration of its source. Not that Mr. Adams as a Railroad Commissioner should naturally be supposed to be opposed to or to take no interest in plans for improving the value, or at least of steadying the value of railroad property, but that he, specially commissioned by the public to watch that their interests receive no detriment from the conduct of railroad corporations, and, more than that, a free-trader of the free-traders, a believer in the efficacy of natural trade laws—of competition—for the regulation of ordinary business—that he should speak favorably of attempts at combination among railroad companies for the avowed purpose of excluding competition, should, indeed, recommend such a combination as favorable, probably, to the public interests, will seem paradoxical to many. Not, however, to those who have read Mr. Adams' previous utterances on railroad policy, not to say those expressed in the last Massachusetts report, in which substantially the same conclusions are arrived at as in this *Atlantic* article, but much earlier ones, in which, having little or nothing to say of railroad combinations, the author declared it as a principle that railroad transportation is not and cannot be made to be subject to the ordinary laws which govern competition. That competition exists was unquestionable, but that it was a competition like that in most other business, constant, universal and nearly uniform in effect, could be maintained by no one. Mr. Adams simply affirms that the uncertain, irregular and local competition which does exist is not beneficial to the community nor to the corporations; that on the contrary it often has a destructive effect on certain individual and local interests; that the protection which the public needs must at any rate be sought in some other way; that one good effect of a combination is likely to be a cessation of discriminations; and that the public will know how to protect itself from extortions, in one way or another, and can do it better when it has to deal with a single organization having a responsible head than when the carriers are many and pursue many different policies.

Mr. Adams takes the report of the Committee of the Chicago Board of Trade on discriminations against Chicago, made last winter, as his text. This committee was appointed to investigate the reported discriminations and to propose a remedy. It reported that the discriminations existed. Substantially, it said that the Chicago rates were not too high, but that those to neighboring competing points were too low; that a combination of railroad companies had been able to maintain reasonable rates from Chicago to the East but had not been able to maintain them from interior points further south, because of the great competition there, so far unregulated. The remedy proposed was that a new competitor should be encouraged to complete a line to Chicago, in the hope, we suppose, that then all business would be done at unprofitable rates, and that this condition of things would last forever. Mr. Adams says:

"In the present somewhat confused and bewildered state of the public mind in respect to the railroad system, it is curious to consider what might have been the effect upon it had the Chicago committee, as the result of their investigations into the admitted state of facts, presented a bold, blunt, paradoxical report in lieu of the somewhat commonplace document with which they contented themselves. They certainly had the means of doing so, and no better text from which to preach is likely to offer. They might well have begun by reminding their audience of the simple principle, which the world is apt to forget in cases where railroads alone are concerned, that, wherever it is possible for them to do so, men engaged in any branch of trade will combine sooner than ruin themselves by unlimited and endless competition. They might have gone on to point out that Chicago was then suffering, in comparison with other places, under the effect of one of these combinations; but that, if Chicago was not suffering in this way, other places would be, for such inequalities and hardships always had been and necessarily were incident to the existing railroad system and must remain incident to it just so long as it continued to exist. Just so long as railroads compete with each other, the points at which they compete must needs enjoy very considerable advantages over other points at which they combine. As there is no force known by which men can be compelled to compete with each other in spite of themselves, it necessarily follows that different places must take their chances. The remedy for this condition of affairs, in the case of Chicago, was obvious; that the community was ready to have recourse to it was far more questionable. That remedy lay not in limiting or temporarily breaking up the existing railroad combination, but in extending, perfecting and regulating it. Under these circumstances the cry of monopoly was most shallow and senseless. On the contrary, the fact of monopoly ought to be recognized, and the effort should be to so systematize it as to make it subserve the public interests, and to so extend it that it should include in its operations Milwaukee and Peoria, and all other competing points, as well as Chicago. Then at last equality would be secured, while the regulation of a confessed and recognized monopoly, whether through the force of public opinion or the direct intervention of the Government, might with confidence be relied upon as sure to follow. So far as the community as a whole was concerned, experience clearly showed that the difficulty lay not in the fact of the existence of this or any other monopoly, but in the other fact that although really existing it was not recognized and treated as such. In the case of the American railroad system, it had not yet had time, nor indeed had it been permitted, to pass untrammelled through its natural phases of development, in its own time and way, to assume its ultimate shape. Consequently, as recent experience shows, it has not yet been brought into a position in which it can be directly and effectually dealt with.

"Nevertheless, though details are still obscure, it is now obvious enough to what result the ever-increasing pressure of the law of self-preservation is compelling the individual members of the railroad system. The movement is not only direct and irresistible, but it is also rapid, and it is always in the direction of a more perfect combination and concentration of railroad interests. It cannot be denied that hitherto this tendency has been regarded with great popular disfavor, and considered as opposed to every principle of sound public policy. The time, however, has now come in which the public mind should think of things as they are, and be disabused of this prejudice. Henceforward, so far from denouncing and resisting it, every facility and even encouragement should be given to the more rapid and complete combination of railroad interests. As, step by step, this works its way out, the system will be brought into a shape which will admit of something approaching to wise regulation in the interests of the public. Then, and not until then, will such unjust discriminations as Chicago has recently had cause to complain of cease to exist."

Mr. Adams then offers "some considerations in support of the proposition that the obstacle in the way of any satisfactory solution of the American share of the railroad problem by no means lies in the success with which those managing railroads have effected combinations, but rather in their inability to effectively combine." That is, the evils which the community has most reason to complain of are those due to the incompleteness of the monopoly in railroad transportation. Universal competition would give at least something like equality in rates; but universal competition in railroad transportation is evidently impossible, because there are not, and without enormous waste of capital there cannot be, many carriers for each place. A general monopoly would also probably give equality, though it might be extortionate; but a partial monopoly, a monopoly covering one city but not another, a row of way stations, but not the termini, one branch of traffic but not another, inevitably produces discriminations, whatever be the disposition of the several carriers. To make an income, they find themselves compelled to accept unduly small profits on the business of competitive points, because otherwise they would get none of the business, and of course none of the profits; and to charge higher rates on that account at non-competitive points. Whatever may be desired of the railroad company, this conduct is almost always forced upon it, the alternative usually being the sacrifice of the just claims of the proprietors of the road. Not that all the discriminations made in favor of competitive points are unjust discriminations; not that the effect of the fierce, unrestricted and in many respects destructive competition of American railroads

has not resulted in much that is good. Indeed, if it shall ever end in a combination more advantageous than the competition, its advantages—its endurableness, indeed—will be due chiefly to the fact that it was arrived at through a series of competitive struggles, in which the capacity of the country and of the roads, the most advantageous centres of trade and manufactures, and the great channels of traffic were pretty thoroughly and certainly developed. Theoretically, there never should have been a railroad constructed so as to invade the territory well served by another. One line can do any given amount of work within its capacity much better than two can. Practically, however, the present efficiency of railroad transportation is due chiefly, perhaps, to the influence of competition; and the greatest actual objection to a combination of carriers lies not in the danger of extortion, which could not be permanently practiced by such a monopoly in this community, but in the possibility of an arrest in the progress of improvements in transportation.

Mr. Adams reviews the history of railroad combinations in this country, dividing them generally into combinations for agreeing upon rates and combinations for "pooling" earnings. The first is the most unsatisfactory, as it depends wholly upon the "good faith of very unscrupulous men, thoroughly versed in every device of evasion." We may add, that it affords no means whereby the different parties to the agreement may know whether it is actually kept. There is no central power informed of the transactions on all the lines. By pooling, if the arrangement is a permanent one, no one has any motive for "cutting" rates or making efforts to divert the traffic from a rival; but this combination, too, lacks a central authority, and is likely to be broken whenever any company thinks that great advantage can be secured by so doing. The lack of a responsible head, too, makes it objectionable to the public, which must be able to hold some definite person or body responsible when it has no protection from competition.

Mr. Adams finds this latter objection overcome in the "Saratoga agreement" of 1874, by which a Board of Commissioners had the control of the competitive business, or rather had nominally the control of it, having power to make regulations, but not being able to enforce them. "There was no substitute for the constable," Mr. Adams says.

He next describes the Southern Railway and Steamship Association, of which he says:

"So far as the public is concerned, everything essential as a safeguard against abuse seems in this case to exist. It is a complete, but not a secret combination. It exists in the full light of publicity. The purposes for which it was organized are openly avowed, and its every transaction is, or may easily be made, matter of general observation. To secure this result it would only be necessary to give it legal recognition. It is, however, by no means generally appreciated as yet what an important matter as respects railroads this publicity is. In fact it overshadows everything else. It is not too much to say that from the moment the railroad system grows, or can be brought, into such a shape that its working is carried on without concealments, from that moment the most difficult phase of the railroad problem may be looked upon as solved. As a necessary consequence of their combining together, the members of the Southern association put forward before the community an avowed and responsible head, answerable for every abuse. Upon him, and through him upon each and all members of the association, the full weight of public opinion could be brought to bear. In case of discriminations or extortions the community, and it need be its political representatives, would know just where to look for a remedy."

The great obstacle to combination, as is at least partly recognized by Mr. Adams, is not the popular fear of them, which has gone so far as to pass laws prohibiting them in some of the States, but the indisposition of the companies to combine. For a combination, to be at all effective, must include all the competitors. Some insignificant company, through obstinacy or stupidity (or perhaps timidity) may insist on maintaining its independence. It may ordinarily control but a trifle of the competitive traffic, yet it is able substantially to dictate the rates at which all of it shall be carried, and, to some extent, the manner in which the competition shall be made. If this traffic was essential to it, the stronger companies might bring it to terms or ruin it by competition at unprofitable rates. But this traffic may afford but a trifle of its income, the company being sufficiently supported by traffic which is not competed for. In the latter case, it may command the situation and prevent indefinitely a combination which all the great carriers desire, and which would render great economies possible. This necessity of unanimity has prevented success heretofore and may delay it hereafter. But there are some legitimate reasons for hesitation on the part of railroad companies when such combinations are proposed, especially in this country where growth is rapid and changes are great. A railroad company rarely feels certain that its business is fully developed. Perhaps it has heretofore carried but 18 per cent. of the traffic for which five lines compete, and is offered 20 per cent. If it will enter a pool. But likely enough it has some new connection in construction or some new contract under negotiation by which it is confident of securing at least 25 per cent. of the traffic, and so does not feel justified in accepting the offer. Doubtless, as Mr. Adams says, the continuation of destructive competition will incline managers more and more to make permanent combinations; and of course,



competition may be so continued as to ruin absolutely all but the strongest company, which will then have an opportunity to purchase at foreclosure sale and thus bring under its own management roads that have been competitors. The "survival of the fittest," however, has not the same sense among railroads as in most things. A railroad company may be ruined, but the railroad remains, and it may continue to remain an actual obstacle to the most economical transportation though ruined half a dozen times over.

Mr. Adams concludes that combination among railroads—the exclusion of competition—would probably be advantageous economically, avoiding many useless expenditures. We think there can be no doubt of this, and that the saving in capital alone would have amounted to hundreds of millions had the construction of lines for the purpose of sharing traffic of other lines been avoided. He also concludes that it would be advantageous politically, a single great corporation being less dangerous than "the many log-rolling little ones;" the sentimental objection, that great railroad combinations are "unrepublican" is an "argument of the kind which sets refutation at defiance." We may add that if combination brings regular and low rates, puts an end to unjust discriminations, is attentive to the convenience and comfort of travellers and shippers, yields obedience to the laws, respects public opinion and saves millions of dollars to the community, including a considerable amount for the proprietors of the railroads, it really does not make much difference whether it is republican or autocratic.

The signs of the times indicate that combination will be reached in some way. If it is by agreement, it may be in the form of associations voluntarily entered into, governed by fixed rules, and perhaps fortified by legal sanctions; if it be by conflict, a long series of competitive wars, in which all suffer and many are ruined, it will probably be by a series of gigantic consolidations into railroad systems, as much more extensive than those of France and England as this country is greater than those.

#### THE OTHER SIDE.

Last week we gave a little sketch of the sort of complaints that are often made of the performance of locomotives. Very soon after the arrival of that number of the *Railroad Gazette* in the office of an old master mechanic, the writer of the article referred to happened to come into his presence just as he had finished reading "What a Locomotive Should Do." "Oh," he said, "you just hit some of those fellows, but there is another side to that question." As Dr. Holmes says most questions are at least hexagonal, it was not surprising that the question referred to had two sides. In fact, a subject which has not more than two sides must be lacking in substance, because all solid bodies must have more than two. "Why," he said, a master mechanic is often placed in a very difficult position. When locomotives or other machinery are to be bought, instead of consulting the master mechanic, frequently the engines are selected and the contract is made by a person who does not know whether the throttle-valve lets the steam into or out of the boiler, and couldn't tell a grate-bar from an eccentric rod, and would be in doubt whether the water in the boiler was inside or outside of the tubes. The master mechanic's views are often disregarded, or he is not consulted at all. What you say is quite true: there are master mechanics who, through ignorance, prejudice, or perhaps worse, will not do what would be to the true interests of the companies which employ them; but what of those master mechanics whose pride is in their occupation, who have devoted their lives to learning the art, and, as far as their opportunities would permit, the science of the construction and operation of locomotive engines? Such men are often obliged to receive engines on their roads which they know to be badly adapted to the service which they are intended to do, and possibly constructed of poor material or badly designed. The engines are ordered by some one higher in authority, who assumes that because he knows all about the traffic or accounting departments, or is a judge of fast horses, that he is competent to say how a locomotive should be built. When the engines arrive, they do not work satisfactorily, and you know that it is not always an easy matter to tell at once what is the matter with an engine. A diagnosis of the causes of its defects is often as difficult as it is for a doctor to tell what ails a patient. Often as soon as an engine arrives he sees deficiencies which, if consulted, he would have prevented, and which his experience has taught him long before how to avoid. Meanwhile all the obloquy caused by the engines working badly is heaped on the shoulders of the master mechanic, and he must bear what he is in no sense responsible for."

We are obliged to confess that our friend was right, and that his view of the subject is one which needs to be kept in mind quite as much as the other.

It is often surprising to see how little consideration is exercised in the purchase of locomotives and other equipment. The specifications are prepared in the most careless way; the most important stipulations are often entirely omitted, and instead of carefully considering all

the points involved some hasty conclusion is arrived at; the contract is given to some favored bidder, and if the engines turn out well the person who ordered them boasts about it ever after, but if not, they become a heritage of complaint and expense as long as they last.

Then, too, it often happens that it is not only the views of the master mechanic which should be considered. The road-master should be heard. Only a short time ago we published in these columns the testimony of half a dozen or more roadmasters condemning in the strongest terms the Mogul engines, owing, as it was said, to their destructive effect upon the track. On the other hand, it can be shown clearly that the train expenses of carrying freight are very much reduced by hauling large rather than small trains. When this is proposed, however, the master car-builder is apt to file his objections, on the ground that with such trains the cars will be pulled to pieces, the transportation department, in the meanwhile, asserting that its conductors' wages are not increased if he has fifty instead of thirty cars to look after, nor the number of brakemen increased in the same proportion. It will therefore be seen that the class of locomotives which can be employed profitably is a somewhat complex subject, requiring the consideration of the views of each of the departments referred to. The inference to be drawn is, that in order to secure the best possible management, there must be co-operation; and that the different departments must work toward a common end. The fullest discussion is therefore desirable, which is promoted by frequent meetings of the various officers, with full liberty to criticize and inquire.

The evil, however, of which our friend, from whom we quoted, complains, is that those who are not experts assume to be judges in those departments of the details and general practice of which they are ignorant. Thus, while it is desirable that the officers of the different departments should consult with each other, they must not assume to be authority anywhere else than in their own special field. The person in charge of the traffic department is doubtless better able to tell how—that is, at what times, speeds, and place—trains should run to accommodate and carry the traffic to best advantage; but he ought not to exercise authority about such things as the weight and proportions of engines. The road-master should know how to keep up the track, and his authority be accepted in regard to it; but, excepting so far as they effect the track of which he has charge, he should be without a voice in the design of rolling stock.

It seems to be a besetting sin of American institutions that every person holding office assumes to know everything about every subject. Some railroad officers seem to be peculiarly liable to this sort of mental gluttony, as it might be called. Railroads are now assuming such enormous proportions, and the business is becoming so complicated, requiring such a variety and such far-reaching knowledge, that, to be conducted intelligently, their managers must aim to employ specialists of the highest authority in each department, and their advice concerning the matters about which they are informed should be accepted in preference to that of those who know less.

#### UNITED STATES RAILROAD STATISTICS FOR 1875.

From advance sheets of the introduction to Poor's Railroad Manual of the United States for the current year, kindly supplied us by the publishers, we extract a summary of results, and found the following comparisons:

Poor's Manual, then, gives as the total mileage of railroads completed in the United States at the close of 1875 as 74,658 miles. The mileage of roads from which reports of capital, earnings, expenses, etc., have been collected for the Manual is 71,759 miles, or 96 per cent. of the whole, and considering that much of the other 3,000 miles had not been in operation long enough to afford material for reports of a year's earnings and expenses, this proportion is remarkably large. It is not correct to say that the reports are for the year 1875. The reports are those last made by the several companies, either to their companies or to State officials. Some of them are more than a year old; some of them cover several months of the current year. Probably every one of the reports, however, includes a part of 1875; and there is nothing else which will compare with this statement as a general view of the whole railroad system of the United States and the results of its operation.

Comparing the figures for the whole mileage reported for two years, we have:

	1875.	1874.	Inc. or dec.	P. c.
Mileage worked.....	71,759	69,273	Inc. 2,486	3.6
Capital stock.....	\$2,198,601,281	\$1,990,997,486	Inc. \$207,603,795	10.4
Fund'd and other debt.....	2,459,697,349	2,230,766,108	Inc. 228,931,241	10.3
Total capital.....	4,658,298,630	4,221,763,594	Inc. 436,535,036	10.3
Earnings from freight.....	363,960,234	379,466,935	Dec. 15,506,701	4.1
Earnings from passengers.....	130,105,271	140,999,081	Dec. 1,893,810	1.3
Gross receipts.....	893,065,505	920,466,016	Dec. 27,400,511	3.0
Working exp'n's.....	317,559,067	330,895,058	Dec. 13,335,991	4.3
Net earnings.....	185,506,438	189,570,958	Dec. 4,064,520	2.1
Dividends paid.....	74,294,208	67,042,942	Inc. 7,251,266	10.8

These are large figures, and the notable thing about them is that while the increase in mileage was but 3.6 per cent. and there was an actual decrease in gross and net

earnings, there was an increase in capital of more than 10 per cent., amounting to \$436,500,000 in all. This must be largely due to the accumulation of interest on the bonds of the bankrupt roads. Down to this time comparatively few of these have been reorganized with a reduced capital, and while the interest is unpaid, of course the debts of the companies go on increasing by the amount of this interest. When reorganizations are made there is not often a reduction of capital. Stockholders are given some kind of paper which counts as much as Baltimore & Ohio shares in adding up the total for the country, and overdue coupons, the payment of which is well nigh hopeless, are redeemed in stock or income bonds. At the close of 1875 there was nearly \$800,000,000 of American railroad bonds which were or had been in default, and the accumulation of debt by these must have been at the rate of \$50,000,000 a year or more.

It will be easier to form an idea of the actual condition of the roads by the following table of the amounts of capital, earnings, etc., per mile of road:

	1875.	1874.	Inc. or Dec.	P. c.
Capital stock.....	\$30,639	\$28,741	Inc. \$1,898	6.6
Fund'd and other debt.....	34,276	32,203	Inc. 2,073	6.4
Total capital.....	64,915	60,944	Inc. 3,971	6.5
Earnings from freight.....	5,072	5,478	Dec. 406	7.4
Earnings from passengers.....	1,938	2,035	Dec. 97	4.8
Total receipts.....	7,010	7,513	Dec. 503	6.7
Working expenses.....	4,425	4,777	Dec. 352	7.4
Net earnings.....	2,585	2,736	Dec. 151	5.5
Dividends paid.....	1,035	938	Inc. 97	6.9
Percentage of expenses.....	63.12 p. c.	63.58 p. c.		
Percentage of net earnings to capital.....	3.98 p. c.	4.50 p. c.		
Average dividend.....	3.38 p. c.	3.39 p. c.		

The increase in dividends was made up entirely on the Union and Central Pacific roads.

These figures show the combined influence of an increased mileage of railroads and a stagnant condition of business. Earnings per mile have shown a steady decrease, the reports for 1874 and the succeeding years giving the amounts as \$8,256, \$7,948, \$7,513 and \$7,010 respectively, and the decrease in the four years being 15 per cent. The decrease in net earnings since that time has not been so great, from \$2,890 to \$2,585, or 10½ per cent. Under almost any circumstances, this was inevitable, for the mileage of the country was being increased beyond any possible increase of traffic. The mileage reporting was more than 25 per cent. greater in 1875 than in 1872. The smaller mileage, however, earned but \$35,000,000 less gross and but \$20,000,000 less net than the larger one.

We have received this introduction so late that we can barely mention the fact that it is prefaced by a "Historical Sketch of the Internal Improvements in the United States," specially prepared for the Manual with great labor and care, and especially suitable for this Centennial year, which is also the semi-centennial of the first American railroad charter. To this we hope to refer hereafter.

The new Manual will be ready for delivery in a few days; we need not say that it is almost indispensable to those who have occasion to study American railroads.

#### The Rock Island Report.

The Chicago, Rock Island & Pacific report for the year ending with March last shows gross receipts at the rate of \$10,845 per mile of road, which is 1 per cent. less than last year, but there was \$317 per mile saved in expenses against \$109 decrease in receipts, and the net earnings thus increased about 4 per cent. There was an increase of 8½ per cent. in passenger mileage, accompanied by an increase of about 5½ per cent. in passenger receipts; there was also a slight increase (0.2 per cent.) in tonnage mileage, but a large part of this was company freight, and in paying freight there was a decrease of 2½ per cent. in tonnage mileage, accompanied by a decrease of 3½ per cent. in freight earnings. The second track was lengthened 16.8 miles during the year, a 75 ft. grade in Iowa reduced to 45 ft. (now the ruling grade of the division), the Oklafoosa branch extended 24½ miles, all main-line renewals of rails made of Bessemer steel, to the extent of 66.2 miles, charged to construction, 12 locomotives, 6 coaches and 156 freight cars, all made in the company's shops, added to the equipment, 6½ miles of new sidings made, and several new buildings erected, so that the company's property was materially improved during the year; while the capital account was increased \$1,000,000 by an issue of 6 per cent. income bonds. After paying all expenses, interest charges, rentals and 8 per cent. dividends on the stock (interest on the new \$1,000,000 of bonds for only half a year), not including the expenditures on account of the leased Chicago & Southwestern road, which are in the nature of an advance to that company and form a lien on its property, the company's balance was increased \$1,213,000, and at the close of the year was the large sum of \$7,756,000. Of this, \$4,020,000 is in the substantial form of the company's own stock, usually considerably above par and now worth about 109; but it is noticeable that dividends are not paid on this stock. Advances made to the Chicago & Southwestern form most of the rest of this balance.

The lack of any report of the result of the operations of the Chicago & Southwestern Railway makes the report imperfect. By comparing the balance sheets of the two last reports we find that the item of "advances to pay coupons, Chicago & Southwestern Railway Company" was increased by \$350,000.00 during the year, and that of "advances for expenditures upon Chicago & Southwestern Railway Company" by \$377,595.41. The \$350,000 is the entire interest guaranteed, whence it may be concluded that the road had no net earnings to apply to interest; whether the working expenses exceeded the income, and part of the "expenditures upon the Chicago & South-



western Railway Company" was to make up the deficiency, or was to improve the line, the report does not enable us to know. These two items amount at this time to more than \$3,286,000, and form an obligation against the lessor company which probably will only be satisfied by the transfer of its road.

The payments on account of this road have been made, so far as the reports show, as follows:

Neither balance sheet nor income account for the year 1871-72 shows any charge on these accounts, but the Vice-President's report says that the Rock Island Company, which had then worked the road about a year, had been compelled to expend about \$500,000 from its own net earnings for completing the Chicago & Southwestern, above any receipts from the earnings of the latter, and it is probable that the lessee also had the whole amount of interest to pay that year. The report for 1872-73 is the first one in which the balance sheet has entries against the Chicago & Southwestern. Beginning with that, the yearly entries for advances to it have been:

	For interest.	Expenditures.
Down to March 31, 1873.....	\$569,712 49	\$,088,839 88
1873-74.....	357,000 00	.....
1874-75.....	350,000 00	.....
1875-76.....	350,000 00	577,595 41

Totals, March 31, 1876.....\$1,619,712 49 \$1,636,435 29

The percentage of working expenses on the Rock Island road is, and always has been unusually small—it is a little less than 50 per cent. for last year—but the road is able to secure larger average rates than some of the other Chicago railroads. Assuming the proportion of expenses to be the same for both freight and passengers, the receipt, expense and profit per ton and per passenger per mile on this road have been for two years, in cents:

	Receipt.	Expense.	Profit.
Per passenger mile.....	1875-76 2.90	1.45	1.45
	1874-75 3.03	1.59	1.43
Per ton-mile.....	1875-76 1.90	0.955	0.945
	1874-75 1.90	1.002	0.918

The expenses are about the same as on the Chicago, Burlington & Quincy, and do not differ greatly from those of the other leading Chicago railroads.

#### The Grain Movement.

The shipments of grain of all kinds from the eight principal Northwestern markets for each week from April 22 to June 17 have been, in bushels:

Week ending—	By Lake.	By Rail.	Total.	Per cent. by rail.
April 29.....	1,634,541	2,072,946	3,707,487	56
May 8.....	2,445,191	2,292,633	4,737,824	48½
" 13.....	1,535,526	2,392,940	3,928,466	60
" 20.....	1,602,170	2,016,304	3,618,474	55½
" 27.....	1,747,409	1,820,456	3,567,865	51
June 3.....	2,412,162	1,797,922	4,210,084	42½
" 10.....	2,894,915	2,147,670	5,042,585	42½
" 17.....	2,927,005	2,361,511	5,288,516	45

Total for eight weeks.....17,196,318 16,842,682 34,039,000 49½

Though the rail shipments have increased, and for the last week were larger than ever before, the increase in lake shipments has been so much greater that at last the latter became more than half of the total since navigation opened.

Of the total shipments of those ports since the 1st of January, nearly 60 per cent. has been within the last eight of the 24 weeks. The previous shipments were entirely by rail, navigation not being open, and the quantities moved in each way from Jan. 1 to June 17 were: by rail, 40,596,535 bushels; by lake, 17,196,318 bushels, or 70 and 30 per cent. respectively. Nothing approaching this is to be found in the records of previous years; generally the lakes take as much as 70 per cent. of the total grain shipments of lake ports. However, these figures do not cover one-fourth of the season of navigation.

The receipts at the different Atlantic ports of corn and of grain of all kinds since April 22 have been, in bushels:

	Corn.	Per cent. of total.	All grains.	Per cent. of total.
New York.....	4,467,298	25.3	15,680,692	44.9
Boston.....	1,866,993	10.6	2,613,347	7.7
Portland.....	120,900	0.7	373,777	1.1
Montreal.....	562,589	3.2	2,783,544	7.9
Philadelphia.....	5,387,000	30.4	7,284,600	20.8
Baltimore.....	4,386,500	24.9	5,001,125	14.3
New Orleans.....	869,571	4.9	1,139,287	3.3
	17,631,861	100.0	34,866,342	100.0

Since the week preceding, Philadelphia, Boston and Montreal improved their positions, while New York lost considerably, in total grain receipts, Baltimore just maintaining its position. In proportions of corn receipts, Philadelphia and Montreal gained considerably. New York lost nearly as much as they gained, and Baltimore gained barely a trifle. New York has received by about a fourth of the corn since navigation opened; Philadelphia and Baltimore together taking about five-ninths. The three chief ports, (which together 80 per cent. of all grains) have all done a thriving grain business this year. Philadelphia, apparently, has gained more in proportion than any other port, but the receipts at such since navigation opened have been large almost without example, and are still increasing, those for the last week reported being the largest yet, 5,190,000 bushels against an average of 4,250,000 for the seven weeks preceding. The prospect entertained a few weeks ago, that this rapid movement would soon cease because of exhaustion of stocks, the Northwestern markets shipping at that time much more than they received, has been revolutionized by the sudden great increase in receipts at the Northwestern markets, these being for the last week reported nearly six million bushels, and much more than the shipments, while there was a greater difference the same side the previous week.

#### Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

**Boston, Concord & Montreal.**—The Fabian Branch is extended from Fabian, N. H., eastward to Mt. Washington, 7 miles.

**Columbus & Toledo.**—The track from Delaware, O., is extended northward 16 miles to Marion.

**Tezas & Pacific.**—Extended from Eagle Rock, Tex., west to Mountain Creek, 5 miles.

This is a total of 28 miles of new railroad, making 656 miles completed in the United States in 1876, against 336 miles reported for the same period in 1875, 603 in 1874, and 1,387 in 1873.

#### Erratum.

In the report of the Master Car-Builders' Convention in our issue of June 16 a reference intended to be to what is known as "Pease's compound coach oil" was printed "Penn's coal oil." The reference was to an article manufactured by Mr. F. S. Pease in Buffalo. Unfortunately, there were other errors, manifestly such, which there was no means of correcting when these reports went to press.

MAY EARNINGS are reported in our table for 32 railroads with 15,741 miles of road, or about 21 per cent. of the total mileage now worked. These, with an increase of 1.6 per cent. in mileage, show an increase in earnings amounting to 6.3 per cent. The earnings per mile of road have increased from \$544 to \$569, or 4.6 per cent. Of the 32 reporting 19 show increased earnings.

For the five months ending with May we have reports from 29 railroads, all but one of which also report for May alone. These had 13,829 miles of road this year, about 19 per cent. of the whole mileage of the country. Their aggregate gross receipts were 11 per cent. greater this year than last, from a mileage 2½ per cent. greater, and the receipts per mile increased from \$2,237 to \$2,430, or 8.6 per cent.—certainly a large increase. Only three of the 29 roads report a decrease, and in nine cases the increase is more than 20 per cent. Last year for the same five months our table showed a similar increase in earnings per mile (8.8 per cent.) over 1874; but then we had reports from only 13 roads, ten of which report this year also. Doubtless the larger earnings of many lines this year since navigation opened are due to an enormous increase of traffic at lower rates than last year, and are accompanied by a considerable increase of expenses; but of the roads in the table, only eight or nine, with about 3,000 miles of road, have had their rates much affected by the railroad war, while most have had their traffic promoted by the low rates. Thus there is reason to believe that the net earnings have kept pace with the gross receipts of most of the roads reporting, since lake navigation opened, while during the winter we know that expenses were materially lighter than last year. The return is indeed very encouraging.

THE REMOVAL OF THE OBSTACLE OF DISTANCE has hardly been better illustrated than in the case of the English actor, Mr. George Rignold, now playing in San Francisco and under engagement to play in Australia, to meet which he must sail from San Francisco just fifteen days after the close of his engagement there. It seems that last winter Mr. Rignold promised to appear in a performance for the benefit of a New York dispensary. Being reminded of this, he wrote that he would return to New York after the close of his San Francisco engagement, appear the next night in the benefit performance, and start back the next day for San Francisco, which he could reach just in time to catch the Australian steamer. Thus the actor crosses the continent twice, making a journey of 6,600 miles, to play a single night.

THE MICHIGAN CENTRAL ELECTION resulted in the substitution of three New York men in the directory for Mr. Joy, of Detroit, and Mr. Hunnewell and Mr. Brooks, of Boston. Only one of the old Boston directors (Mr. Nathaniel Thayer) is left in what was but a few years ago peculiarly a Boston company. Several of the new directors are also directors of the Delaware, Lackawanna & Western and the Rome, Watertown & Ogdensburg. In the board there are now several very wealthy men, and if they have a controlling interest in the stock, they will probably be able to keep it, dividends or no dividends, if they so choose.

THE AMERICAN INSTITUTE OF MINING ENGINEERS has been holding an unusually protracted session in Philadelphia, beginning Monday of last week and closing Saturday this week. A great many good speeches were made, and the days of discussions were so alternated with excursions to places where objects of professional interest were to be seen that the session was made pleasurable as well as profitable.

#### NEW PUBLICATIONS.

No. 23 of Van Nostrand's Science Series is an essay on the "Fatigue of Metals under Repeated Strains," from the German of Prof. Ludwig Spangenberg, with a preface by S. H. Shreve. It is reprinted from *Van Nostrand's Magazine*. "These experiments," Mr. Shreve says, "prove that there is a limit of strain within which iron is practically indestructible, and that that limit is but little over 30,000 lbs. per square inch for the best iron." Spangenberg's experiments are a continuation of Woehler's, and the chief value of this essay is the resume of Woehler's work which occupies the first half of it. Woehler's experiments and investigations extended over a period of some fifteen years, and are of very great value, but his works have not been translated into English, and sufficient attention has not been given to the important facts which he brought to light. Spangenberg is to be credited for some extension of the experiments and some limitation of the rules which Woehler deduced from them, but the great and really original work was Woehler's, and it is to be hoped that the credit due him will not be ascribed to his follower in this country, simply because Spangenberg has been translated while Woehler has not been. A journal entitled the *Railway Age* has been started in Chicago, the first number bearing date June 17. It is similar in form to the *Railroad Gazette* (the page a trifle smaller), and the first number has 20 pages, seven of them advertisements. This number is almost entirely devoted to railroad news; but attention to all departments of railroad business is promised. As to the quality of its contents, we

are hardly in position to give an unprejudiced opinion, and our readers may easily judge for themselves, as doubtless they can get copies on application. Mr. Charles W. Hassler (to whom all of us have been invited to write "whether we wish to buy or sell" railroad bonds) has issued a little pamphlet entitled "Coupons," in which an account is given of an interesting case involving the negotiability of detached railroad bond coupons. In this case a banker bought coupons of Danville, Urbana, Bloomington & Pekin and Indianapolis, Bloomington & Western bonds, which, as it turned out, had been stolen. Payment of the coupons was refused on this ground, and suit was brought, the question at issue being whether the coupons ranked with ordinary negotiable paper, to which an honest purchaser acquires a title by law, whether the seller had one or not. The case was finally decided by the New York Court of Appeals, which holds that the character of the coupon depends upon what is promised on its face. It may be equivalent to a promissory note, in which case it ranks with ordinary negotiable paper; and it may be simply evidence of a debt and not negotiable. In the case in point, ten of the coupons contained simply the statement that the railroad company would pay \$35 at such a date and place to the bearer, and were just like a promissory note. These, the Court decides, must be paid. The others contained the statement that they were interest warrants on such and such bonds payable at such time and place. These the Court decides not to be negotiable paper, and therefore the thief could not convey any title to them, and the purchaser cannot collect them.

Under this decision, the character of coupons becomes a matter of importance. Mr. Hassler in this pamphlet gives the form of coupon of several kinds of bonds, and says that whether the coupons are of one class or the other, a purchaser will not obtain a good title as against all previous holders if the coupons have been more than three days overdue; but if just due, the title will depend upon the form of coupon, as decided by the Court of Appeals. Mr. Hassler, by the way, has begun the practice of law, making a specialty of railroads and railroad securities.

#### THE UNITED STATES INTERNATIONAL EXHIBITION.

##### VI.

##### CAR SPRINGS.

The exhibitors of American car wheels are all clustered together on the north side and near the west end of Machinery Hall. Scattered around them are the car and locomotive springs. These are of almost every conceivable pattern, and steel seems to be twisted into all kinds of shapes in order to give the greatest amount of flexibility and elasticity. It will surprise most railroad men who are not experts to find how much there is to learn about the design and manufacture of springs. To those who have never studied the subject, a spring will appear to be a more or less crooked combination of steel plates or bars, intended to form a flexible and elastic support for a car, engine or other vehicle. The practice heretofore, and it may safely be said, still is, at many places, to entrust the manufacture of these articles to an experienced blacksmith, who has more or less skill, and who looks wise and mysterious as he draws hieroglyphics on the dirt floor of his shop, or as he plunges the heated plates into a vessel of inscrutable liquid to give them the requisite temper. The proportions of the springs were, and still are, made by such men "by the eye," and sometimes, it must be confessed, they were very good; but a recollection of some of the enormous piles of steel plates which were sometimes used under locomotives produces the conviction that often the proportions, the temper or the material of the springs must have been wretchedly adapted to the purposes that the spring was intended to fulfill. The truth is that springs, like nearly every other article employed on railroads, have been subjected to more or less scientific analysis. At the same time, spring manufacturers and master mechanics have been experimenting on the action of springs, so that a workman must now have some better reason for the form and proportions which he gives to springs than one which he has evolved by some process of inscrutable "inwardness."

A number of the exhibitors have also machines for testing springs, by subjecting them to pressure, and thus compressing them to the extent of their elasticity. This "shows" the action of the springs when loaded and compressed. Another method of testing springs which is employed in Europe has not, so far as is known, been used here. That is to place the spring under a slotting-machine and make the stroke of the head equal to the action of the spring and then start the machine with a revolution counter attached, so that the number of times which the spring is compressed will be accurately recorded. Doubtless simply compressing a spring by a screw or hydraulic press shows the form which it assumes when loaded, but it gives no idea of its endurance under continued action. However, this is not intended to be a treatise on springs, but a description of those exhibited.

##### NICHOLS, FICKERING & CO.

This Philadelphia firm has a space 12 ft. square, on which they have erected a platform which is neatly carpeted, and on which they have arranged their springs in a very tasteful manner. The railing around their exhibit consists of columns made of volute and spiral springs, which is a very happy conceit. On top of the railing and on each side of the enclosure are arranged a set of locomotive springs and equalizing levers, and at the back several different kinds of car springs.

This firm exhibits specimens of elliptics 22 in. long × 3½ in. made of 3½ × 5-16 in. plates. These are for freight or coal cars; also pairs of elliptics 30 in. long × 5½ of 3 × 5-16 plates; 32 in. long × 5½ of 3 × 11-32 in. plates, and triplet springs, that is three springs attached together side by side, 36 in. long × 8½ in. of 3 × 11-32 in. plates, the latter for pas-



senger cars. They have also a specimen of Mr. Ashbel Welch's compound spring for six-wheeled passenger-car trucks. These consist of one full elliptic on top of a half elliptic. These are placed on the outside of the wheels and rest on the swing-bearers which project outside. An engraving of a truck with these springs was published in the *Railroad Gazette* of Sept. 30, 1871, page 295.

The locomotive driving springs already referred to are 38 in. long and made of  $3\frac{1}{2} \times \frac{1}{2}$  in. plates. The exhibit also contains tender springs 48 in. long of  $4 \times \frac{1}{2}$  in. plates; one such spring 39 in. long; one locomotive spring 40 in. long, of  $3 \times \frac{1}{2}$  in. steel; one 20 in. spring for coal cars, volute springs from  $2\frac{1}{2}$  in. diameter  $\times$   $2\frac{1}{2}$  high, up to 6 in. diameter and 9 in. high. The smaller sizes of the latter springs are used on wood-working machinery. The firm also exhibit nest spiral springs made of flat bars of steel: these vary in size from 4 in. diameter  $\times$   $5\frac{1}{2}$  high, with three coils up to  $8 \times 8$  in. The larger springs have four coils and are used for equalizing bars of passenger cars, and also for bearing springs for freight cars. What are called special draw springs are made of round steel in nests of two coils, and are from  $4\frac{1}{2}$  in. diameter  $\times$   $5\frac{1}{2}$  in. high to 6 in. diameter and  $9\frac{1}{2}$  high. Similar springs are made of flat bars  $1\frac{1}{2} \times \frac{1}{2}$  in. rolled edgewise and made of a concave form somewhat like a mark of parenthesis, ). Similar springs are also shown made of round-edged steel.

The exhibitors also show specimens of freight car springs, consisting of groups of six springs made of  $\frac{1}{2}$  in. round steel in coils 3 in. diameter, and enclosed in cast-iron cases. They also exhibit the Thomas cast-steel reversible nut lock washers, of various sizes. These were illustrated in the *Railroad Gazette* of April 17, 1875 (page 153). The chief objection to this portion of their exhibit is that most of the washers are nickel plated, and are therefore not the same article which they supply to purchase. It would be much more effective if the nickel-plated articles were replaced with others "selected from stock."

A very neat screw punch for notching steel rails completes the list of articles which this firm have sent. It is made of cast steel, weighs only 65 lbs., and will punch a notch  $\frac{1}{4} \times \frac{1}{4}$  in. through plates or flanges  $\frac{1}{2}$  thick.

J. JEFFRIES' SONS, of Philadelphia, are represented by an assortment of elliptic and semi-elliptic springs, some of the latter being single, others in couples and triplets. The former are for locomotives and tenders, the latter for passenger cars. They have also examples of spiral nest springs. There is very little that can be said of this exhibit, further than to enumerate the articles which the exhibitors have been wise enough to select from their stock, making no attempt at display. Some of these, true to the traditions of Philadelphia, are painted a dark buff or drab, and are commendably free from all chromo iniquity. The exhibit is, however, deficient in not being provided with any means of communicating information to visitors, and the services of a dusting brush would not be misapplied if it were to hover about the objects displayed.

THE COLUMBIA CAR SPRING COMPANY, of New York, exhibits what are called rubber-packed spiral springs. These consist of a hollow rubber cylinder with a steel coiled spring outside and another inside the rubber cylinder. One pattern consists of a rubber cylinder 4 in. diameter on the outside,  $2\frac{1}{2}$  diameter inside and 7 in. high, with a spiral spring of flat steel on the outside and another coil on the inside of the rubber. Another has a single coil  $3\frac{1}{2}$  in. diameter  $\times$  7 in. high, made of round steel with rubber inside of the coil, and there is also a pattern with a coil of round steel 11-16 in. diameter on the outside of the rubber cylinder, and another coil of  $\frac{1}{2}$  in. steel on the inside; the rubber being  $4\frac{1}{2}$  in. diameter on the outside, and 3 in. diameter inside, the spring being 6 in. high and held between two cast-iron caps.

There are also nest springs made of round steel and of the following sizes:  $5\frac{1}{2}$  diameter  $\times$   $6\frac{1}{2}$  in. high with three coils; 7 in. diameter  $\times$  9 in. high with two coils; also similar springs made of half round steel in three coils  $5\frac{1}{2}$  in. diameter  $\times$  6 in. high, and 3 in. diameter  $\times$  5 in. high; and others made of flat bars with round edges, one  $5\frac{1}{2}$  in. diameter  $\times$  6 in. high with three coils, and another of five coils 8 in. diameter  $\times$  8 in. high. Besides these there are group springs of six coils each 3 in. diameter  $\times$   $5\frac{1}{2}$  in. high with cast-iron cap and base.

The springs are all exhibited on a table 30 in. square, and most of them have apparently been draw-filed before being tempered. They present a very neat appearance, but unless the company is in the habit of finishing all its springs in that way, those on exhibition do not fairly represent the articles they manufacture and supply to the trade. This company, we believe, manufactures some of its springs from chrome steel, but whether any of those on exhibition are made of that material we are unable to say. It is but justice to add that from sources which are regarded as trustworthy it has been learned that springs manufactured by this firm have shown an extraordinary endurance when subjected to severe tests. Whether they were made of chrome steel, cannot now be stated with certainty.

#### THE CULMER SPRING COMPANY, OF PITTSBURGH.

It is surprising to observe in what a variety of styles such very ordinary looking objects as car springs may be exhibited. The Culmer Company manufactures only, or perhaps it should be said, chiefly, coiled springs made of round steel. These are exhibited in a glass case, placed on shelves rising above each other like successive steps. These are covered with some dark material, and the springs are most of them nickel-plated, so that the effect is somewhat like that of the silver ware exhibited in the main building. The arrangement is very good; the springs are good, as we know from sources of information quite independent of those who make and sell them; but why did not the Culmer Company withhold the nickel-plating? Its exhibit would have been so much better without it and would have cost so much less than it did.

This company manufactures spiral springs made from the finest steel wire, up to those made of steel bars one inch in diameter. It has spiral springs in use in this country and also in Europe, in steam-gauges, valves and other delicate instruments where a very fine quality and uniformity of tension are required, and now has orders for spirals 8 in. diameter made of one-inch steel, which require a bar of steel over 100 feet long to make one spring, and has fifty spiral springs in operation on Westinghouse's model of his atmospheric and vacuum brakes. It has about fifty specimens of coiled springs, chiefly car springs, on exhibition, of different sizes and shapes, all, with a very few exceptions, made of round steel. They are made of every variety of shape and size, arranged singly, in pairs, and groups of three, four, five, six, seven, and eight, and also in nests of two and three coils. As already indicated, they are made for a great variety of purposes besides use under cars. It was stated by the agent of this company that the springs on exhibition, although nickel and gold-plated, are entered for competition, and will be subjected to any desired test. Doubtless they are just as good springs, notwithstanding their ornamentation. A man's beard, if dyed, doubtless serves its purpose just as well as if it was not, but then a person with a purple mustache does not inspire the confidence which he would if that appendage was left *au naturel*.

With its exhibit the Culmer Company has a supply of its excellent descriptive pamphlet. This gives a tolerably full description of the articles exhibited, and the method of their manufacture. The company's agent is also in attendance part of the time, so that abundant means of furnishing information are supplied.

#### MESSEURS. A. FRENCH & CO., OF PITTSBURGH.

This firm has the largest manufactory of railroad springs in the country. Their exhibit, however, is modest in proportion to the size of their works. They have a space about 12 $\times$ 24 ft., in which they have examples of their springs neatly painted in lead color, with the exception of one set which are highly polished and inclosed in a glass case. Alongside the platform on which the springs are shown is a hydraulic press for testing the springs. This consists of a ram which works upward from the floor with a table on top on which the spring is to be tested or placed. On top of the machine is a long and very powerful lever, the bearing points of which rest on knife-edges, like the beams of a scale. This lever is weighted with any desired load at the outer end, the load resting on a suitable support until the pressure of the ram under the spring is sufficiently great to raise the lever and its load from the support. The pump for working the ram is operated by steam power. Alongside the testing machine is a small hydraulic lift for handling the springs to and from the testing machine. The platform on which the springs are displayed is neatly carpeted, and provided with a desk and chairs.

The springs exhibited are all either elliptic or semi-elliptic patterns, and of the following sizes: one pair of the Pittsburgh, Fort Wayne & Chicago Railway standard freight car springs, 20 in. long with five plates of  $3\frac{1}{2} \times 11-32$  in. steel; one pair of the Chicago & Alton Railroad standard freight car springs, 22 in. long with six plates of  $3 \times 11-32$  in. steel; one triplet of the Philadelphia & Reading Railroad standard passenger car springs, 30 in. long and of five plates of  $3 \times 11-32$  in. steel; one triplet of the Central of New Jersey standard passenger car springs, 36 in. long, with five plates of  $3 \times 11-32$  in. steel; one triplet of the Pennsylvania Railroad standard passenger car spring of same size, but with six plates; one triplet, same size, but  $\frac{3}{4}$  in. plates; one triplet, 40 in. long, with six plates of  $3 \times 11-32$  in. steel; one quadruplet of Pullman's four-wheeled truck palace car standard, 36 in. long, with five plates of  $3 \times 11-32$  in. steel. Sixty sets of the latter are now in use under Pullman's cars in England. Besides the above, they exhibit one half-elliptic freight-car spring, 30 in. long with six plates of  $3\frac{1}{2} \times 11-32$  in. steel, with capacity for a load of 5,000 lbs.; one half-elliptic freight-car spring, 32 in. long, with six plates of  $3\frac{1}{2} \times 11-32$  in. steel, capacity 5,000 lbs.; two 34 in. locomotive springs, with ten plates of  $3 \times 11-32$  in. steel, capacity 9,000 lbs.; two 34 in. locomotive springs, with thirteen plates of  $4 \times 11-32$  in. steel, capacity 13,000 lbs.; two tender springs, 48 in. long, with eighteen plates of  $3\frac{1}{2} \times 11-32$  in. steel, capacity 12,000 lbs. There is also another quadruplet elliptic of the New York Central Railroad standard, 35 in. long and of four plates of  $3 \times \frac{3}{4}$  in. steel.

In the manufacture of springs, Messrs. Wells, French & Co., have endeavored to so proportion the different parts as to give the spring an equal amount of flexibility through its whole length when loaded. If one part of a spring has less stiffness or strength than another, it will, of course, bend most at the weakest place, and instead of distributing the flexure over its whole length there will be a tendency to concentrate it at one place, and consequently the spring is liable to break at that place. The duty which a spring has to perform is that of *bending* under a load. If this bending occurs at one place only, or if one place bends more than the rest because there is less material at that place than elsewhere, then it is plain that the spring would be strengthened, or would endure longer, if a part of the material were removed from the stronger places, so as to make it of uniform flexibility all through. Now this is what Messrs. French & Co. have aimed to do, that is, to make a spring of uniform strength all through its length, so that the total amount of bending will be distributed equally through all the steel in the spring. By this means they have accomplished what seems paradoxical, made springs stronger by making them lighter.

Some of those exhibited were subjected to tests under the writer's observation, and showed that while being compressed until the bands touched each other, the amount of flexure was the same all through their length.

#### N. & A. MIDDLETON & CO., OF PHILADELPHIA.

It might be remarked of this exhibit, as of some others, that it is remarkable how great a variety of arrangement is possible in exhibiting springs. This firm have a pyramid or rather cone

of successive shelves, on which they have arranged the articles which they manufacture. These consist chiefly of small coiled springs arranged in groups in cast iron cases. The coils are from one to two inches in diameter and are made of  $\frac{1}{4}$  to  $\frac{1}{2}$  in. steel wire. They also exhibit what is called the Godley spring, which is a coiled spring made of steel, the section of which has somewhat the form of a letter  $\neg$  laid on its side. That is, the inner edge is rolled thicker than the outer one. Alongside of the stand is what car-builders would call a truck side, with a set of the Middleton springs arranged over an equalizing lever. There is also a pair of jaws and boxes, with a pair of the springs arranged over the boxes.

Across the aisle from the stand is a spring-testing machine also exhibited by this firm. It is operated by a screw from below, which is worked by a long lever with a pawl and ratchet. The springs are loaded on top by a lever in the same way as was described for the machine exhibited by Messrs. A. French & Co. When Messrs. Middleton & Co. first put up their exhibit, most of the springs were brilliantly painted in red, white and blue. Like the ruling politicians, Mr. Middleton found that there were some things the public would not tolerate. The color of his springs was such a thing. He was beset with a storm of ridicule, so that finally he employed the services of a painter, and had the patriotic colors obliterated, and now his exhibit appeals to the public in more subdued and becoming raiment. His testing machine, although clothed anew, is still not entirely guiltless.

But joking aside, this firm have arranged their articles very neatly, and in the construction of the shelving have shown some very odd and ingenious conceits. The railing and column, for example, are made of the coils of wire from which the springs are manufactured. Their exhibit shows very clearly their system of springs, facilities are given for testing them, and it lacks only in not having either an attendant or suitable circulars describing the exhibit, and the processes of manufacture of the springs.

Description of the other exhibits of springs must be reserved until next week.

## General Railroad News.

### ELECTIONS AND APPOINTMENTS.

**Eminton & Shipperville.**—At a meeting held in Eminton, Pa., June 17, the following directors were chosen: James M. Dickey, C. W. Mackey, Franklin, Pa.; James Bennett, James W. Rowland, Marcus Huling, Eminton, Pa.; W. J. McConnell, Parker, Pa.; Henry Wetter, Clarion, Pa.; P. F. Kribbas, Edensburg, Pa.; Jacob Black, Shipperville, Pa. The board elected James Bennett, President; J. M. Dickey, Vice-President; J. W. Rowland, Secretary and Treasurer; W. J. McConnell, Superintendent; James Bennett, Solicitor.

**Eastern.**—Under the agreement with the creditors, the Massachusetts Supreme Court has appointed Wm. C. Rogers, of Brookline, Wm. G. Bacon, of Boston, and Willard Phillips, of Salem, trustees.

**London, Huron & Bruce.**—Three vacancies in the board caused by the resignation of local directors have been filled by the election of Right Hon. Hugh Childers, Mr. F. Broughton and Sir Charles Young, Mr. Childers being President, Mr. Broughton General Manager, and Sir Charles Young a director of the Great Western Company.

**Laclede & Fort Scott.**—At the annual meeting recently, the following directors were chosen: C. W. Colehour, G. A. Fitch, G. G. Merrick, A. C. Mitchell, J. F. Safely, P. F. Scanlan, W. H. Scanlan.

**Connecticut Railroad Commission.**—Mr. George W. Arnold, of Haddam, has been reappointed Railroad Commissioner.

**Vicksburg & Meridian.**—The board of managers for the current year is as follows: Morris Emanuel, Peter Anderson, Thomas Rigby, Wm. Crutcher, A. B. Reading, George A. Parker, John A. Klein, Thomas M. Smedes, James R. McDowell, J. C. Stanton, Martin Kearny. The officers are: President, Thomas Rigby; Vice-President, Wm. Crutcher; Secretary and Treasurer, N. G. Bryson; General Superintendent, E. F. Raworth; Assistant General Superintendent, George D. Lawrence; Master Mechanic, James B. Browne.

**Colorado Central.**—The names of the directors chosen by the local stockholders at the annual meeting in Golden, Col., May 18, are as follows: Joseph A. Thatcher, Thomas J. Richman, John Turck, Central City, Col.; John C. Hummel, John H. Wells, Longmont, Col.; Edward L. Berthoud, Charles C. Welch, Wm. A. H. Loveland, Golden, Col.; Oren H. Henry, Boulder, Col.; Gilbert N. Belcher, Jefferson County, Col.; Oliver Ames, Boston. The board elected Wm. A. H. Loveland President and General Manager; John H. Wells, Vice-President; Edward L. Berthoud, Secretary; John C. Hummel, Treasurer; G. V. Belcher, T. J. Richman, O. H. Henry, C. C. Welch, Executive Committee. The President has appointed Oren H. Henry Superintendent; Foster Nichols, Auditor; E. W. Rollins, Cashier; Edward L. Berthoud, Engineer; W. G. Brown, General Freight and Ticket Agent.

**Michigan Central.**—At the annual meeting in Detroit, June 26, the following directors were chosen: Samuel Sloan, Moses Taylor, George F. Talman, John J. Astor, Isaac Bell, August Belmont, Rosewell G. Rolston. New York; Nathaniel Thayer, Boston; Frederick Billings, Woodstock, Vt. The new directors are Messrs. Bell, Belmont, Billings and Rolston, who replace James F. Joy, Sidney Bartlett, John W. Brooks and H. H. Hunnewell. Of the new directors Mr. Rolston is President of the Farmers Loan & Trust Co. of New York; Messrs. Belmont and Bell are well known New York capitalists, and Mr. Billings is equally well known from his connection with the Vermont railroad lines and the Northern Pacific. Mr. Thayer is the only remaining representative of the Boston party which formerly controlled the road. The new board met June 28 and elected Mr. Samuel Sloan President. Mr. Sloan is already President of the Delaware, Lackawanna & Western and several of its allied companies, of the International & Great Northern and the Marquette, Houghton & Ontonagon, and has for several months been Vice-President of the Michigan Central.

**Burlington & Northwestern.**—At the annual meeting in Burlington, Iowa, June 22, the following directors were chosen: Thomas Hedge, Charles Mason, E. D. Rand, John H. Gear, George C. Lanman, W. W. Baldwin, Richard Spencer, William Gillies, David Leonard, Robert Donahue, George Millard, John W. Gilbert, W. W. Cartwright, J. M. F. Andrews, J. W. Crawford. The board elected Thomas Hedge, Jr., President; Chas. Mason, Vice-President; R. M. Green, Secretary and Treasurer; John S. Cameron, Ch. of Engineer and Superintendent.

**Burlington Cedar Rapids & Northern.**—This company was organized in Burlington, Ia., June 19, by the bondholders who have purchased the Burlington, Cedar Rapids & Minnesota road at foreclosure sale, by the election of the following directors: S. C. Bever, E. F. Winslow, Cedar Rapids, Ia.; James I.



**Gilbert, Burlington, Ia.; John I. Blair, Blairtown, N. J.; Charles Bard, Norwich, Conn.; John M. Denison, Baltimore; M. Shepard Bolles, Boston; Frederick Butterfield, L. P. Morton, Wm. S. Nichols, Wm. S. Opdyke, Alexander Taylor, Frederick Taylor, New York.** The board elected Frederick Taylor President; Gen. E. F. Winslow (now Receiver), Vice-President and General Manager; Alexander Taylor, Treasurer; W. D. Walker, Secretary; C. Stickney, Assistant Treasurer; Wm. S. Opdyke, General Solicitor.

**Rome & Clinton.**—At the annual meeting in Rome, N. Y., June 21, the old board was re-elected. The board elected officers as follows: President, H. W. Bartlett, Clinton, N. Y.; Vice-President, E. B. Armstrong, Rome, N. Y.; Secretary and Treasurer, A. W. Mills, Clinton, N. Y.

**Rome, Watertown & Ogdensburg.**—Mr. J. W. Moak, heretofore Superintendent, has been appointed General Manager.

**Terre Haute & Indianapolis.**—Mr. A. McGinnis has been appointed Chief Train Dispatcher, in place of E. R. Parenteau, deceased.

**New York Central & Hudson River.**—The following circular has been issued: "It having been deemed expedient to separate the duties of the office of the General Passenger and Ticket Agent, Mr. Charles H. Kendrick, the present General Passenger and Ticket Agent, will, on and after this date, relinquish the duties of Passenger Agent, and continue as General Ticket Agent, with office at Grand Central Depot, New York."

"Mr. C. B. Meeker has been appointed General Passenger Agent, and communications will be addressed to him at Grand Central Depot, New York."

Mr. Meeker has long been connected with the company.

**South Mountain & Boston.**—At the annual meeting in Branchville, N. J., June 20, the following directors were chosen: Wm. H. Bell, John Bunnell, James H. Dunning, Gilbert I. Grover, James McCoy, C. V. Moore, J. C. Van Horn, F. M. Ward, C. A. Wortendyke.

**Galveston, Harrisburg & San Antonio.**—Mr. A. W. Dickinson has been appointed General Superintendent, in place of Mr. H. Eddins, resigned. Mr. Dickinson was formerly a Division Superintendent on the Missouri Pacific.

**Stony Brook.**—At the annual meeting in Lowell, Mass., June 26, Wm. A. Burke, Benjamin F. Clark, James B. Francis, Sewall G. Mack, Jacob Rogers, George F. Richardson and Joseph H. Read were chosen directors. The directors afterward elected J. B. Francis, President, and Jacob Rogers, Clerk and Treasurer. The road is leased to the Boston & Lowell and Nashua & Lowell companies.

**United States Railroad Mutual Life Insurance Association.**—At the annual meeting in Philadelphia, June 21, the following officers were chosen: President, Franklin Fairman, Illinois Central; Vice-Presidents, Wm. S. Cottinger, Pennsylvania; O. P. McCarthy, Indianapolis, Bloomington & Western; W. B. Fracker, North Pennsylvania; John J. Lyle, Kentucky Central; James A. McMillan, St. Louis, Alton & Terre Haute; General Secretary and Treasurer, R. D. Keen, United New Jersey; Executive Committee, O. C. Briggs, C. D. Alexander, R. B. Jones, Wm. Bendle, Joseph H. Wetmore; Finance Committee, Charles M. Gingley, David McKnight, Morton Mills.

**Memphis, Cherokee & Ellsworth.**—The first board of directors is as follows: J. J. Colby, J. J. Cramer, W. H. George, B. Evans, A. D. Sanborn, N. D. Butler, Thomas M. Cotte. The office is at Peabody, Kan.

**Kansas, Colorado & Pacific.**—The first board of directors is as follows: Elmer Riggs, Wm. H. Appleton, N. L. McCreedy, G. S. Forrest, Wm. Whitworth, Wm. Bond, New York; A. D. Jaynes, C. H. Pratt, T. C. Sears, B. P. McDonald, C. F. Drake, D. M. Huett, C. Goodland, Kansas. The office is in Fort Scott, Kan.

**Canton Company.**—The new board has elected Charles J. Baker, President; George S. Brown, Vice-President; Wm. W. Janney, Treasurer.

## THE SCRAP HEAP.

### Railroad Manufactures.

The Pacific Rolling Mill at San Francisco is now rolling a lot of rails for the Central Pacific, besides turning out the usual amount of bar-iron, spikes, etc.

The Wyandotte Rolling Mill Company will hold a special meeting at the office in Detroit, July 13. The call for the meeting says: "Matters of importance will be laid before the meeting, including the expediency of some improvements to the property, of a reorganization, providing a larger working capital, and for funding the bonded indebtedness becoming due within the next three years."

Wells, French & Co., of Chicago, have orders for building freight cars for the Milwaukee, Lake Shore & Western, the Chicago & Pacific and the Atchafalaya, Topeka & Santa Fe roads.

The Schenectady Locomotive Works last week received an order for 10 more locomotives for the Central Pacific road. They will all have 17 by 24 in. cylinders, three of the 5½ ft. and seven 5 ft. drivers.

The Indianapolis Rolling Mill is at work on a large contract to re-roll rails for the Ohio & Mississippi road.

The Jackson & Sharp Company is building passenger cars for the Atlanta & Richmond Air Line, the Burlington & Lamoille, the Long Island and other roads. Their shops at Wilmington, Del., are now employing about 300 men.

Neshannock Furnace, at New Castle, Pa., will blow out Aug. 1.

A new iron company has been organized at Middlesex, Pa., with B. F. Veach President and W. R. Burnett, Treasurer. The object is to buy and work the old rolling mill there.

The Harlan & Hollingsworth Company, at Wilmington, Del., is building passenger cars for the Philadelphia, Wilmington & Baltimore, the Camden & Atlantic, the Scioto Valley and the Tioga roads. About 50 cars have been turned out this year.

The Brazil Furnace Company has been organized at Brazil, Ind., with a capital of \$150,000.

A Belgian journal says that the Fitchburg Steam Engine Company, of Massachusetts, about six months ago sold a pumping engine for use in Holland, where heretofore the English have supplied nearly all such engines, and recently it shipped the eighth of its engines to Amsterdam.

### Correction in Train Accident Report.

The following appeared in the list of train accidents for May: "On the morning of the 10th an excursion train, bound for the Centennial on the Philadelphia, Wilmington & Baltimore road, ran into a train of empty cars on the Junction road at the Gray's Ferry crossing in Philadelphia. Two of the empty cars were wrecked and the road blocked an hour or more."

We are informed that the collision occurred upon the Junction Railroad, which is not under the management of the Philadelphia, Wilmington & Baltimore. It was not at Gray's ferry, which is a station on the last named road, but at a point on the Junction Railroad a mile away from the Baltimore road. The location of the accident at Gray's Ferry was made from a statement in a local paper.

### Tests of a Highway Bridge.

The Pittston (Pa.) Gazette of June 16 thus describes the testing of a bridge recently erected there to replace one carried away last year:

"The new structure is a tubular wrought iron arch bridge, erected by the King Bridge Co., of Cleveland, Ohio. It has four long spans across the stream, varying from 200 to 220 ft. in

length, and three shorter spans, over the canal and street from 50 to 70 feet each, with a short span of 18 feet over the Lehigh Valley Railroad, making a total length of 1,040 feet.

On Monday morning a test of the bridge was made in accordance with the guarantees of the contractors. The capacity of the bridge was calculated for 80 lbs. per square foot, including sidewalks, and as the roadway is 18 feet in the clear, and the sidewalks calculated for 5 feet each (since changed to 6 feet), it shows a working load of exactly one ton (2,240 pounds) per lineal foot. The test load applied is only about one-fourth of the working load, and as that is calculated with a factor of five for safety, it is about one-twentieth of its maximum load without permanent set or injury to any of its members. An idea of the immense strength claimed for this bridge may be gained by taking, for instance, the third span—220 feet in length, which at 80 lbs. per square foot, shows a working load of 492,800 lbs., and a maximum load without injury, of 2,464,000 lbs.

We present below the certificate of Engineer Conrad, giving the result of the test:

No. of Span.	Length.	Center Deflection under load.	Permanent set.	Return after load.
1.....	211 ft.	0.035 ft.	0.0 ft.	0.035 ft.
2.....	208 "	0.118 "	0.068 "	0.05 "
3.....	220 "	0.098 "	0.05 "	0.048 "
4.....	200 "	0.077 "	....	0.035 "

"First, second and third spans were loaded with 16 teams—estimated weight, 55 tons.

"Fourth span—11 teams were on at first, and deflection caused by 5 additional ones—the return being above the first point, in consequence.

"Greatest center deflection, 1-1746 of span.

"Greatest permanent set, 1-3029 of span."

The tests were made under the charge of Mr. C. F. Conrad, Civil Engineer.

## OLD AND NEW ROADS.

### Sioux City & St. Paul.

The operations for May are reported as follows:

Freight .....	\$17,726 64
Passenger .....	7,636 73
Mail, express, etc. ....	2,411 33

Total earnings (\$188 per mile).....	\$27,774 70
Expenses (95 per cent.).....	26,474 25

Net earnings .....	\$1,300 45
Rents received .....	89 00
Equipment bond sinking fund.....	1,231 34

Total.....	\$2,620 79
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Rebates.....	\$1,873 33
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Special equipment.....	2,448 00
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State taxes.....	1,81 49
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Insurance .....	200 00
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Deficit for the month.....	\$2,982 03
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The increase in gross earnings over May, 1875, was 9.4 per cent.

### Denison & Mineola.

Application has been made for a charter for a railroad to run from Denison, Tex., the southern terminus of the Missouri, Kansas & Texas, southeast through Bonham and Greenville to the junction of the Texas & Pacific and the International & Great Northern at Mineola. The distance is about 110 miles. It would give the Missouri, Kansas & Texas a new connection to Houston, which, however, would be much less direct than its present one.

### United States Railroad Mutual Life Insurance Association.

The seventh annual convention of this association was held at the Grand Exposition Hotel in Philadelphia, June 21. The association was formed seven years ago, for the relief of the members and their families in case of misfortune or death, principally through voluntary contributions.

The President of the association, Franklin Fairman, of Chicago, made the annual address, and gave some practical suggestions in regard to altering the constitution and by-laws, and dwelt on the depressed situation of the country.

The Secretary, Mr. R. D. Keen, reported 28 members deceased; 1 dismissed; 753 forfeited, and 5 withdrawn during the year, leaving a membership of 1,943. During the year \$43,308 were paid to 31 claimants. The receipts other than assessments were \$2,994.80; payments, \$2,732.68; balance, \$262.12. The average amount paid to each claim during seven years has been \$1,608.28.

After a recess the convention met in the evening when the Executive and Finance Committees presented their reports. Officers for the ensuing year were then elected. The Committee on Constitution presented its report, which was adopted with some amendments. After selecting Chicago as the place for the next meeting the convention adjourned.

### Memphis, Cherokee & Ellsworth.

A company by this name has filed articles of incorporation in Kansas. The capital stock is to be \$4,000,000, and the office is at Peabody, Kan.

### Kansas, Colorado & Pacific.

This company, which recently filed articles of incorporation in Kansas, proposes to build a railroad from Fort Scott, Kan., westward through Southern Kansas and Colorado to the San Juan mines and thence west to the Pacific coast at some point not yet decided on. The estimated length of the road is 1,000 miles. The office is at Fort Scott.

### Pacific of Missouri.

The date of the foreclosure sale under the third mortgage has been fixed for Sept. 6, in St. Louis.

### East Tennessee, Virginia & Georgia.

The East Tennessee & Georgia bonds maturing July 1, will be paid on and after that date; those payable in August, Ga., at the office of the Georgia Railroad & Banking Co.; those payable in New York at the office of R. T. Wilson & Co., or all in New York, at the option of the holder. Interest will cease from that date. Holders desiring to reinvest will be supplied with East Tennessee, Virginia & Georgia first-mortgage bonds at 93. The amount of the bonds payable July 1 outstanding by the last report was \$135,000.

### Auction Sales of Railroad Securities.

In New York, June 28, at auction, Toledo, Wabash & Western stock brought 2; Great Western, of Illinois, second-mortgage bonds, 64½; Mobile & Alabama Grand Trunk first-mortgage bonds, 0½; Rome, Watertown & Ogdensburg stock, 21½ to 22½; Houston & Texas Central stock, 12½.

### Baltimore & Potomac.

A Washington dispatch, dated June 24, says: "As a result of a joint meeting of the Senate Committee on Public Buildings and Grounds and the House Committee on Railroads, a resolution is to be drawn up for future consideration, by which communication to the President of the Baltimore & Potomac Railroad is to be made of the fact that unless arrangements are made by the company within a specified time to remove their present depot in this city and the tracks of the road on

Sixth street, the committees would take steps to secure such legislation as will compel the removal in question. The committees are desirous that the company should consent to carry out their wishes in this respect without further legislation, and now have under consideration the subject of a new site for a depot. Many of the members are in favor of giving the company a site just north of the eastern terminus of the Long Bridge, but as yet nothing definite has been determined on."

### Dividends.

Dividends have been declared by the following companies: Illinois Central, 4 per cent., semi-annual, payable Aug. 1. Connecticut River, 4 per cent., semi-annual, payable July 1. Housatonic, 5 per cent., quarterly, on the preferred stock, payable July 10.

Georgia, 4 per cent., payable July 15.

Old Colony, 3 per cent., semi-annual, payable July 1.

Lowell & Andover (leased to Boston & Maine), 3½ per cent., semi-annual, payable July 1.

Delaware, Lackawanna & Western, 2½ per cent., quarterly, payable July 20.

Central Ohio (leased to Baltimore & Ohio), 2½ per cent. on common, and 3 per cent. on preferred stock, both semi-annual and payable June 30.

United New Jersey, 2½ per cent., quarterly, payable July 10.

### Hearne, Belton & Western.

It is said that arrangements have been made to build a section of 10 miles from Hearne, Tex., westward.

### Cincinnati Southern.

The bridges are now being put up and the track is to be laid on the section from Shelby City, Ky., to the King's Mountain tunnel. A lot of cars has already been received at Shelby City. Work is to be pushed on the Cumberland River Bridge, for which the American Bridge Company of Chicago is contractor.

### Sioux City & Pembina.

This road is now completed and open for traffic from a junction with the Dakota Southern road, near Sioux City, Ia., northward up the valley of the Big Sioux River to Portlandville, in Plymouth County, Ia. The distance we have not yet been able to ascertain. The road is worked by the Dakota Southern Company.

### Nashville, Chattanooga & St. Louis.

The operations for the eleven months ending May 31 are reported as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Gross earnings.....	\$1,633,037	\$1,585,495	Inc.	3.0
Expenses.....	962,825	1,097,948	Dec.	12.3

Net earnings.....	\$670,512	\$487,547	Inc.	37.5
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Per cent. of expenses.....	58.94	69.25	Dec.	10.31
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The gross earnings this year were \$4,775, and the net earnings \$1,961 per mile.

### Gulf, Colorado & Santa Fe.

An engine has been put upon the track and some construction cars are expected soon. When they arrive the work of tracklaying will be pushed forward as fast as possible.

### Galveston, Harrisburg & San Antonio.

The contract for the completion of the road to San Antonio being signed, work on the grading is now in progress on the west side of the Cibola River, and another party is soon to begin at the Salado.

### Texas Western.

Work has been resumed on this road, and it is said that the money has been secured to complete a section of 40 miles from Houston, Tex., westward. The line will be about half way between the Galveston, Harrisburg & San Antonio and the Western Division of the Houston & Texas Central.

### Cape Breton.

It is stated that work will soon be resumed on this road which is to connect the coal mines on Cape Breton Island with the port of Louisbourg. The Louisbourg railroad lands, heretofore held in trust, have been transferred to the railroad company.

### New Orleans, St. Louis & Chicago.

At a meeting of holders of Mississippi Central first and second-mortgage bonds in New York, June 23, a resolution was adopted authorizing the trustees under those mortgages to employ counsel and take such other steps as may be necessary to protect the interests of the bondholders in the suit for foreclosure of the consolidated mortgage now pending.

### Wilmington & Reading.

The United States Circuit Court has granted a decree of foreclosure of the first mortgage. The time of sale is not yet fixed, but it will be about Oct. 1. The road is 72 miles long, from Wilmington, Del., to Reading, Pa., but eight miles, from Birdsboro to Reading, is covered by a separate mortgage.

### Uniontown & West Virginia.

The grading and bridging is now completed from Uniontown, Pa., south to Fairchance, six miles, and everything is ready for the tracklayers. A connection with the Southwest Pennsylvania near Uniontown is now being graded.

### Syracuse, Geneva & Corning.

It is said that work, lately suspended, will soon be resumed and the road pushed to completion as fast as possible.

### Albany & Susquehanna.

The passenger engines, which have heretofore been changed at Onondaga, now run through between Albany and Binghamton, 142 miles.

### Texas & Pacific.

It is stated that this company has completed, through H. G. Stebbins & Son, of New York, the sale of \$2,000,000 of its 6 per cent. first-mortgage bonds to parties in Philadelphia and New York. This sale secures the completion of the road which the company has undertaken to build this year.

On the main line the track has been laid and cars are running to Mountain Creek, Tex., five miles west of the late terminus at Eagle Ford. Work is now progressing rapidly.

The iron for the Transcontinental Division has begun to arrive at Sherman, and the work of laying it will soon be begun.

### Louisville, Cincinnati & Lexington.

The Kentucky Court of Chancery at Louisville, Ky., June 23, in the suit brought by the bondholders granted a decree of foreclosure and sale. The decree makes the lien of the city of Louisville first upon the property, then that of the Louisville & Frankfort and Louisville & Lexington bondholders, and then that of the consolidated bondholders. The claim of the State of Kentucky to a lien upon the property is not allowed.

### Washington City, Virginia Midland & Great Southern.

The foreclosure suit begun in the Virginia State Court at Alexandria is said to have been brought by a creditor who held no bonds, but had a small claim against the company. The suit came to a hearing last week and was dismissed.

Another suit has been begun, however, the bill being filed in the United States Circuit Court at Richmond, June 24, by George W. Scott, of New York, a holder of Orange & Alexandria first and second-mortgage bonds. The complaint sets forth that the bonds are past due; that G. B. Lamar, trustee under the first mortgage, is dead, and that the trust devolved



upon George Collins, of Brooklyn, N. Y., who has refused to accept it or act under it, wherefore plaintiff brings this suit for himself and such other bondholders as may join in it. It is also charged that the Baltimore & Ohio Company owns a large amount of the bonds and stock of the Virginia Midland; that it controls the company, directs its management and the disposition of its revenues, without any regard to the interest of the plaintiff and his fellow bondholders. A decree of foreclosure and sale is asked for, and also the appointment of a receiver during the continuance of the suit. The Orange & Alexandria mortgages cover only the road from Alexandria to Lynchburg, not including the Danville Extension or the Valley Branch.

#### South Mountain.

This unfinished road was not sold at Sheriff's sale as advertised. The judgment, under which the sale was ordered, was paid by Vice-President Rank and the claim assigned to him. The officers of the company are trying to make arrangements to relieve the company from its present difficulties and to provide means to complete the road.

#### Erie.

A London telegram dated June 23 says: "At a meeting of the Erie Railway stockholders to-day Sir Edward Watkin submitted the following plan: That without reducing the rate of interest, beginning next September, they should fund for a period of 4½ years the alternate coupons of the first bonds, paying alternate coupons in gold, and that they should fund for the second bonds nine half-yearly coupons in a lump. Sir Edward suggested that there should be power in 1880 to redeem the second bonds at £80. The meeting adopted the scheme after a complimentary allusion to Messrs. Jewett, Fleming and Miller."

"Sir Edward Watkin explained that, under the scheme submitted to the meeting yesterday, the holders of \$1,000 nominal of the second bonds would receive immediately \$300 in new bonds, which would pay 5 per cent. interest, commencing June 1, 1877. After 1880 the interest on the second bonds which were not redeemed would be reduced from 7 to 6 per cent. Preference and ordinary shareholders were to be assessed respectively 3 and 6 per cent. It was decided that two or three leading Americans should be invited to co-operate and support Jewett."

Work has been begun on the foundations for the new grain elevators in Jersey City, which are to be located south of the present passenger depot and ferry and not far from the Pennsylvania's Harsimus Cove freight depot.

Receiver Jewett's statement for the month of April is as follows:

Balance on hand April 1.....	\$380,307 96
Receipts from all sources.....	1,753,968 85
Total.....	\$2,134,276 81
Disbursements on all accounts.....	1,829,270 85
Balance May 1.....	\$305,005 96

The disbursements exceeded the receipts by \$75,372. The amount of the Receiver's certificates and notes outstanding April 30 was \$1,170,000.

A considerable number of men have recently been discharged from the shops at Jersey City, Port Jervis and Susquehanna. The track force has been cut down and other reductions are to be made.

#### Eastern.

After argument before the full bench the Massachusetts Supreme Court decided that it was within the power of the Legislature to vest the appointment of trustees in the court. The court thereupon appointed as trustees Wm. C. Rogers, of Brooklyn; Wm. G. Bacon, of Boston, and Willard P. Phillips, of Salem.

#### Louisville, New Albany & St. Louis.

The notice of the foreclosure sale of this road, which took place June 20, was last week put, through a very easily made mistake, under the heading of "Louisville, New Albany & Chicago." The error, however, would be very easily detected by anyone knowing anything of either of the two roads in question.

#### Galena & Southern Wisconsin.

It is said that this road is to be extended from its present terminus at Platteville, Wis., along the Little Platte River to Washburn and thence to Wingville, a distance of about 19 miles.

#### Toledo, Wabash & Western.

The Purchasing Committee of the consolidated bondholders makes the following report under date of June 23:

"That under the decree of sale made in Ohio on the 14th December last, and subsequently concurred in by the courts of Indiana and Illinois, the road, equipment, &c., was sold on the 10th inst., at Toledo, Ohio, and bought in by the Purchasing Committee in trust for the gold bondholders, subject to all previous mortgages. The sale has been confirmed by the court in Ohio, but cannot be confirmed for some weeks in the other States, as the courts have adjourned for the summer. As soon as the confirmation of the sale is complete and the deed delivered, immediate steps will be taken for the formation of a new company to take the management of the property. It is our present expectation and intention that the new company shall resume payment on the 1st of February next of the coupons then due on the first mortgages on the main line, between Toledo and the Illinois River, and the Illinois & Southern Iowa Branch, with such further arrangement for the overdue coupons as shall prove satisfactory to the holders. It is intended to resume payment on the 1st of August, 1877, of the coupons of the Decatur & East St. Louis Branch, and on the 1st November, 1877, on the first mortgages of the Quincy & Toledo Branch, and on all the second mortgages on the main line."

"The fullest details of these contemplated arrangements, together with those for the consolidated mortgages, will be published after the new company gets possession of the property."

A stockholder's view of the state of the case is given in the following letter, copied from the New York Evening Post:

"The legal controversy between the Toledo & Wabash stockholders and the holders of gold bonds is substantially as follows: On the 31st of May last, the stockholders at a special meeting held in Toledo appointed agents to defend the foreclosure suit in the name of the company, vesting in them full authority to employ counsel, etc. On the 2d of June a hearing was obtained in the Cass County Court, at Logansport, Ind., the court having decided, after arguments, that the attorney of the agents was entitled to represent the company in defense. The hearing was then continued upon the merits of the application for a stay of foreclosure proceedings, and the court finally decided, on the morning of June 10, just one hour before the sale at Toledo, that the petitioners were entitled to an order restraining the foreclosure, and therefore granted it—requiring the defendants to file the usual statutory bond."

"The Court ruled that the original complaint was erroneous and that the bondholders were not entitled to declare forfeiture of the principal of their bonds; also, that the decree could not cut off the right of redemption reserved by the laws of Indiana, and that the directors could not assist in prosecuting the foreclosure. To these rulings the counsel for bondholders filed a bill of exceptions."

"The decree requires the sale to be confirmed by the courts, and it can have no validity until such a confirmation is secured. It follows, therefore, that no title to the property can be se-

cured by purchasing bondholders until the stay is removed or the decision reversed by the Supreme Court. It is to be presumed, also, that the decree must be amended in regard to the right of redemption in Indiana, the statutory law of that State giving a period of twelve months to the mortgagees in which to redeem. This, we believe is a fair presentation of the case as it now stands."

#### Emlenton & Shippensburg.

Work is actively in progress on this road between Emlenton, Pa., and Turkey Creek, and it is said that money enough has been secured to complete and equip the road to Edensburg. When that is done arrangements will be made for its extension to Shippensburg. The distance from Emlenton to Edensburg is about eight miles; to Shippensburg, 15 miles.

#### Chicago, Danville & Vincennes.

In the United States Circuit Court in Chicago, June 21, in the foreclosure suits, the depositions taken in New York and filed with the Court were ordered to be opened. Counsel for the Receiver entered a motion to suppress the depositions, which will be argued hereafter.

#### Peoria & Rock Island.

Receiver Hilliard presents to the Court the following statement for April:

Cash on hand April 1.....	\$10,118 50
Receipts from all sources.....	27,765 69
Total.....	\$37,884 19
Disbursements for labor supplies, other roads, etc.....	25,808 97
Balance on hand May 1.....	\$12,075 22

The receipts for the month were \$1,956.72 in excess of the disbursements. The report was referred to a master for examination.

#### Burlington, Cedar Rapids & Minnesota.

In pursuance of the decree of foreclosure granted by the United States Circuit Court, this road was sold at public sale in Cedar Rapids, Ia., June 22. The sale included all the branches of the road, and the property was bought in by the Purchasing Committee for account of the bondholders. The price paid was as follows:

Main Line, 220 miles.....	\$100,000
Milwaukee Division, 94 miles.....	30,000
Muscatine Division, 31 miles.....	20,000
Pacific Division, 25 miles.....	20,000
Total.....	\$170,000

The bondholders have organized a new company under the Iowa general law, which is to be known as the Burlington, Cedar Rapids & Northern Railroad Company. It is stated that about four-fifths of the bonds have already joined in the purchase, and most of the rest are expected to do so.

The Receiver will probably close up his accounts by July 1, and transfer the road to the new company on that date. The particulars of the plan of reorganization were given in the Railroad Gazette for April 14 last.

#### Pennsylvania.

A contract has been let to Hanlon & Son, of Newark, and Gen. Wright, of Orange, to ballast all the tracks of the New York Division with stone in place of the present gravel ballast. They have set up four large stone-breakers at East Newark, where a large quantity of trap rock from the Bergen Hill outcrop has been piled for some time, and have begun work on the contract. As soon as a supply of stone is broken ready for use a large force will be employed, and when the Bergen Hill stone is exhausted it is said that the trap rock from Garrett Mountain, near Paterson, will be used. This rock has been largely used by the Telford Pavement Co., of which Gen. Wright is President, and is quarried at a point close to the Morris Canal, so that it can be cheaply delivered at Newark. The road has been for many years ballasted with a coarse yellow gravel, obtained at first from the line near Metuchen, then from a pit at Bonhamtown, to reach which a spur two miles long was built, and lately from a pit near Woodbridge on the Perth Amboy Branch.

#### Burlington & Northwestern.

At the annual meeting in Burlington, Ia., June 21, it was reported that the work of grading to Winfield is well advanced. The iron for that section has been contracted for and will soon be delivered. The board has also contracted for 1 engine, 1 passenger, 1 baggage and 40 freight cars. At the meeting there was talk of an immediate extension from Winfield to Richland.

#### Baltimore, Philadelphia & New York.

The property of this company in Maryland was to have been sold June 20, at Towson town, under a judgment obtained by Walter Scott for work done on the road. The Philadelphia Trust, Safe Deposit and Insurance Company, however, as trustee under a mortgage given by the company, obtained an injunction against the sale, and it did not take place.

#### Colorado Central.

The new management, elected by the local stockholders, has taken and will endeavor to keep possession of the road. It appears that the Union Pacific Company owns 9,350 out of 12,000 shares and the proxies for these shares were duly forwarded at the time of the election, but the necessary seal was not attached. The inspectors therefore rejected them and a board of directors was elected by the remaining 2,650 shares, nearly all of which are held by the towns and counties which voted aid to the road. These have always opposed consolidation with the Kansas Pacific. Doubtless recourse will be had to the Courts to decide the question. In addition to this stock the Union Pacific holds \$1,106,000 first-mortgage bonds.

#### Columbus & Toledo.

The tracklayers who began work at Delaware, O., have reached Marion, 22 miles northward. Another party is at work from Carey south by east and is making steady progress.

#### Burlington & Southwestern.

Receiver Smith has been authorized to complete the 27 miles of road from the southwestern terminus of the Iowa Division at Unionville, Mo., to the northern terminus of the Missouri Division at Ashton. Most of this section was graded three years ago. Its completion will open a new line from Burlington to St. Joseph and Kansas City by the Hannibal & St. Joseph road.

#### Kansas City Bridge.

The bridge over the Missouri at Kansas City, Mo., caught fire June 23 and the two northern spans were destroyed. The loss is estimated at \$100,000, and it will take at least two weeks to make the bridge passable for trains.

#### Costa Rica.

This railroad has been extended recently six miles, and a further section is graded. It is constructed in two distinct sections, one short one on the Atlantic coast, and the rest entirely in the interior, where the chief part of the population is. An attempt will be made by the government to induce the bondholders to take the road and complete it through; and it is thought that the local traffic alone will justify the expenditure. Now the chief product of the country is hauled by oxen 80 or 90 miles from the interior to the Pacific coast, and thence sent either around the Horn or to Panama to be carried over the Panama Railroad. By completing the line to the Atlantic, the traffic can be carried by rail to a port within five days of New

Orleans. The elevation to be overcome in crossing the continent by this route is about 5,000 feet. Most of the difficult work on the Atlantic side is already done. It is thought that the route might be made a favorite one for passengers, as the country is beautiful, and the climate nearly all the way delightful and healthful. In anticipation of the completion of the road, considerable purchases of land have been made along the line, and new clearings undertaken, and the people, who at first were indifferent or worse, are now eager to have the road built.

#### Cincinnati & Martinsville.

This road was sold under foreclosure of mortgage in Franklin, Ind., June 20, and was bought in for \$10,000 by the trustees for account of the bondholders. It is 39 miles long, from Martinsville, Ind., to Fairland and is now worked by the Indianapolis, Cincinnati & Lafayette Company under a temporary agreement.

#### St. Louis, Kansas City & Northern.

The new branch from Ferguson to the St. Louis Union depot was formally opened to traffic June 20. There was an excursion to which a large number of guests were invited, a visit to Forest Park, through which the branch passes, and a collation at Ferguson. The whole affair passed off very pleasantly.

#### Cincinnati & Terre Haute.

Under a decree in foreclosure granted by the United States Circuit Court, John D. Howland, Master, will sell this road at auction in Terre Haute, Ind., Aug. 8. The sale will include the finished road, from Terre Haute to Markland, 26 miles; whatever property may have been acquired on the proposed line, which extends to the Ohio State line; the franchises of the company and its coal lands and mining rights in Vigo, Clay, Owen, Greene and Sullivan counties. The sale is to be for cash, but if the road is bought by bondholders, payment will be received in bonds at a *pro rata* value for any amount in excess of the costs of the suit and expenses of the sale.

#### Grand Trunk.

The board of directors has issued a circular stating that throughout the negotiations with the Great Western Railway Company the Canadian directors and officers, acting under special instructions, have earnestly desired to agree upon and assign to each system a just proportion of the receipts, gross or net, through or local, or to come to any settlement of this nature which could have been or can yet be made acceptable to the Great Western Railroad Company. The Grand Trunk Company board of directors were and still are prepared to accept the arbitration of the Chief Justice of the Supreme Court of the Dominion of Canada, or of Lord Shelburne, or the Chairman of either the Great Western of England, the Northeastern, the Midland, or the London & Northwestern, or of any two of these roads.

#### Ogdensburg & Morristown.

The Watertown (N. Y.) Times says: "A final effort is to be made to secure the railroad from Ogdensburg to Morristown. When the company organized, subscriptions to the amount of about \$13,000 were secured. Within a very short time the required amount of stock of \$10,000 per mile must be taken or the organization dissolved. Books have been opened again." The proposed line will connect Ogdensburg, N. Y., with the Utica & Black River road, and is about 14 miles long.

#### Boston, Concord & Montreal.

Tracklaying on the extension of the Fabyan Branch from Fabyan, N. H., to the foot of Mount Washington in the White Mountains is completed. The extension is seven miles long and makes the branch 22 miles long from the main line at Wing Road to Mount Washington. The last spike is to be driven and the extension opened with much ceremony July 1, when a large number of guests have been invited to be present. The branch connects at its terminus with the railroad up Mount Washington.

#### Lafayette, Muncie & Bloomington.

Through trains began to run over the new part of the line, from Muncie, Ind., to Lafayette, June 20. Trains will run into Lafayette on the track of the Indianapolis, Cincinnati & Lafayette for the present.

### ANNUAL REPORTS.

#### Sheshire.

This company owns a line from South Ashburnham, Mass., west by north to Bellows Falls, Vt., 53½ miles; it leases the use of the Vermont & Massachusetts track from South Ashburnham to Fitchburg, 10½ miles, and it works under agreement with the trustees the Ashuelot Railroad, from Keene, N. H., to South Vernon, 24 miles. There are 13.79 miles of sidings in use. The company's thirty-first annual report covers the year ending Sept. 30, 1875, with a supplement extending the accounts to March 31, 1876.

The equipment consists of 31 engines and 2 snow plows; 22 passenger, 8 baggage and 2 postal cars; 194 box, 15 hay, 34 stock, 151 platform, 4 caboose and 1 drivers' car; 11 wood, 10 gravel, 2 derrick and 1 wood train caboose car.

The property was represented as follows March 31, 1876:

Stock (\$40,249 per mile).....	\$2,153,500
Bonds (\$14,465 per mile).....	775,900
Coupons and dividends unclaimed.....	3,144
Notes payable.....	106,000

Total \$36,754 per mile).....\$3,036,344

Supplies, fuel and materials on hand amounted to \$340,952. The company holds \$165,000 Ashuelot Railroad bonds, \$2,000 Charles River bonds and real estate and woodland not used by the road valued at \$52,000.

For the year ending Sept. 30 the work done was as follows:

	1874-75.	1873-74.	Inc. or Dec.	P. c.
Train mileage.....	633,277	618,149	Inc.	15,128 2.4
Passengers carried.....	161,892	177,046	Dec.	15,154 8.7
Passenger mileage.....	5,250,743	5,968,176	Dec.	717,433 12.6
Tons freight carried.....	415,714	425,418	Dec.	9,704 2.3
Tonnage mileage.....	23,082,087	23,531,401	Dec.	449,314 1.9

The earnings for the same period were:

	1874-75.	1873-74.	Inc. or Dec.	P. c.
Passenger.....	\$180,619 91	\$207,450 99	Dec.	\$26,831 08 12.0
Freight.....	437,951 10	513,473 56	Dec.	75,522 36 14.7
Exp., mail, etc.....	37,693 69	29,683 80	Inc.	8,009 89 27.0
Total.....	\$656,264 70	\$750,608 35	Dec.	\$94,343 55 12.6
Expenses.....	\$81,444 84	\$88,181 05	Dec.	6,736 21 1.1

Net earnings....\$74,819 86

Gross earnings.....\$74,819 86

per mile.....\$7,458

Net earnings per mile.....\$7,458

Per cent. of expenses.....88.00

Included in expenses are \$14,000 for new engine and cars, and \$71,231.62 for new rails. During the year 790 tons new steel, 635 tons re-rolled and 610 tons repaired iron rails were used in repairs, and 44,068 new ties were laid.

The result of the year was as follows:

Net earnings.....	\$74,819 86
Rent of Vermont & Massachusetts track.....	\$54,990 00
Interest paid.....	47,789 78
Deficit for the year.....	\$26,969 89



For the six months ending March 31 the report is as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Earnings.....	\$301,312 69	\$305,841 30	Dec. \$4,528 61	1.5
Expenses.....	193,398 58	280,033 81	Dec. \$86,635 23	30.9
Net earnings.....	\$107,914 11	\$25,777 49	Inc. \$82,136 62	318.6
Gross earn. per mile	\$3,424	\$3,475	Dec. \$51 1.5	
Net " "	1,226	293	Inc. 933 18.6	
Percent. of exps...	64.19	91.57	Dec. 27.36	29.9

The directors' report says:

"The foregoing summaries of accounts of the Chesire Railroad exhibit an unsatisfactory result of the business during the last fiscal year—a result common to most of the great industries of the country. The competition for freight between the east and west, alluded to in our last report, has continued more severe than ever throughout the year, and no improvement in our local traffic has been realized. The cost of labor and of material on the road have declined considerably, but have not kept pace with the rapid reduction of the rates of transportation.

"It is to be observed that while our freight earnings show about \$75,000 less than those of the previous year, the tonnage has fallen off only about 10,000 tons, so that if the rates of service of the preceding year had been maintained, our present account, compared with that of last year, would have shown a diminution of freight earnings of only about \$9,000. It is to be observed also that our operating expenses of the past year were increased by the cost of an extra amount of steel rails, about \$58,000. This year's expenses have also been increased \$7,000 by the payment of a fire damage above insurance, at Charleston, that occurred in 1871. But after every allowance, our present balance sheet is not a subject of congratulation. Our equipment is kept in good condition, our track excellent and better than ever before.

"We have contracted for and are now receiving 600 tons more of steel rails, our experience having fully demonstrated that steel rails of good quality are vastly more economical than iron ones on roads with heavy traffic. The exhibit of page 6 of this report, showing the business of the road for the last six months, during which the earnings show but a slight decrease, while the expenses have been much reduced, assure us that business conditions are becoming more favorable, and that our road will work through the panic to more prosperous times, with credit unimpaired."

#### Southern Minnesota.

This road extends from the Mississippi at Grand Crossing, Minn., (opposite La Crosse) westward to Winnebago City, 170 miles. It has been for some years in the hands of a receiver, on suit of the bondholders. The present report covers the period of 15 months, from Oct. 1, 1874, to Dec. 31, 1875.

The equipment of the road consists of 14 engines; 4 passenger, 3 combined baggage and passenger and 3 mail and express cars; 193 box, 63 flat and coal and 4 caboose cars; 1 tool and 1 pile-driver car.

The report of General Manager W. C. Van Horne gives the earnings for the 15 months as follows:

Freight.....	\$640,575 78
Passengers.....	109,256 17
Express, mail, telegraph and miscellaneous.....	38,408 81

Total earnings (\$4,637 per mile).....	\$788,240 76
Working expenses and renewals (55.93 per cent.).....	440,899 36
Taxes.....	16,212 61

Total expenses (58.00 per cent.).....	\$457,111 97
Net earnings (\$1,948 per mile).....	\$331,128 79

The Receiver's income account is as follows:

Balance, Oct. 1, 1874.....	\$58,487 01
Net earnings.....	331,128 79
Chicago, Dubuque & Minn. R. R. on freight account.....	3,090 00
Sale and exchange of machinery.....	1,307 38
Profit and loss, etc.....	1,498 86

Total.....	\$395,512 04
Construction and equipm. ent.....	\$33,220 37
Partial payment on cars.....	3,090 00
Claims and expenses of foreclos. re.....	60,853 85
Interest on bonds.....	235,647 29

	\$41,821 51
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Balance, Jan. 1, 1876.....	\$53,690 53
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Of which \$36,419.88 is cash on hand and on deposit with the United States Circuit Court.

For the year ending Dec. 31, the following comparisons are made:

	1875.	1874.	Inc. or Dec.	P. c.
Engine mileage.....	365,816	393,375	Dec. 27,559	7.0
Cost of engine service per mile.....	24.1 cts.	25.3 cts.	Dec. 1.1 cts.	4.4
Passengers carried.....	54,101	51,224	Inc. 2,877	5.6
Tons freight carried.....	169,594	167,899	Inc. 1,695	7.4

The engine mileage was calculated on a somewhat different basis in 1875 from 1874. Of the freight transported in 1875, 67.15 per cent. was wheat and flour, 1.06 per cent. other grain and 16.88 per cent. lumber. The earnings and expenses for the calendar year 1875 were as follows:

Freight.....	\$506,798 50
Passengers.....	86,958 14
Other sources.....	29,853 64

Total earnings (\$3,668 per mile).....	\$623,610 28
Expenses and taxes (59 per cent.).....	364,942 32

Net earnings.....	\$258,677 96
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Deducting taxes (\$12,857.66), the expenses were 56 per cent. of earnings.

During the year three miles of new iron rails and 46,031 new ties were used. From the western end of the line 2½ miles of heavy rails were taken up and relaid on the eastern end, the light rails thus replaced being taken to the western section. During the current year five miles of iron rails are needed, and it is recommended that steel rails be laid on the heavy grade near Iainour's. Three new Howe truss bridges, 390 feet in all, were built, and two others, 504 feet in all, are being replaced; 520 feet of pile bridge have been rebuilt, 2,509 feet repaired, and 398 feet new pile bridge built. The sidings have been increased by 2,568 feet. The shops have been moved from Wells to Hokah. There were built 13½ miles snow fence and 11½ miles ordinary fence. The buildings have received repairs and some additions. There were built 18 box and 4 caboose cars. During the year 23.55 miles of right of way have been paid for, leaving 83.28 miles still unsettled.

The total amount of land received from the land grant is 363,203.20 acres, of which 217,816.20 acres have been sold or exchanged for interest due, leaving 145,387 acres unsold, besides 5,600 acres not yet deeded to the company.

The bondholders' committee has completed arrangements for the payment of the overdue interest on the first mortgage bonds in six installments. The arrangement has been approved by the Court, and three installments paid. The balance due holders of land-trust certificates has also been adjusted and partly paid.

#### Vicksburg & Meridian.

This company owns a line from Vicksburg, Miss., nearly due east across the State of Mississippi to Meridian, 140 miles. Its latest annual report covers the year ending Feb. 29, 1876.

The equipment consists of 19 engines; 10 passenger and 3 baggage cars; 69 box, 46 flat and 6 caboose cars. The Master Mechanic reports that 12 of the engines are from 14 to 17 years

old, and many of the cars are also very old. Three engines are now being rebuilt with new boilers.

The capital account is as follows:

Common stock.....	\$387,407.69
Preferred stock.....	971,469.10

Total stock (\$8,778 per mile).....	\$1,328,876.79
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Funded debt (\$22,621 per mile).....	3,176,101.71
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Bills payable.....	63,316.28
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Land scrip.....	1,941.08
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Total (\$32,757 per mile).....	\$4,586,045.38
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The floating debt has been decreased by \$9,943.98 during the year.

The work done during the year was as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passenger train mileage.....	106,725	.....	.....	.....
Freight train mileage.....	87,773	.....	.....	.....
Switching and work-train mileage.....	48,273	.....	.....	.....

Total train mileage.....	242,771	.....	.....	.....
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Passengers carried.....	73,565	70,226	Inc. 3,339	4.0
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Passenger mileage.....	2,779,189	2,664,661	Inc. 114,528	4.3
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Bales cotton carried.....	69,424	62,819	Inc. 6,605	3.4
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Total tonnage of freight carried.....	54,383	42,302	Inc. 11,981	28.3
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Some general averages are as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Train mileage per mile of road.....	1,734	.....	.....	.....
Passenger mileage per mile of road.....	19,787	19,033	Inc. 754	4.0
Average receipt per passenger.....	5.83 cts.	5.71 cts.	Inc. 0.12 cts.	2.1
Average receipt per ton.....	3.87 "	4.28 cts.	Dec. 0.41 cts.	9.6
Cost of engine service per mile, excluding wages.....	1.80 "	.....	.....	.....

The earnings for the year were as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passengers.....	\$161,492 94	\$152,399 58	Inc. \$9,093 36	6.0
Freight.....	298,766 73	254,401 14	Inc. 44,365 59	17.4
Express, mails, etc.....	18,108 08	15,101 32	Inc. 3,006 76	19.9

Total.....	\$478,372 75	\$421,893 04	Inc. \$56,479 71	13.4
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Working expenses.....	284,273 24	291,804 88	Dec. 7,531 64	2.6
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Net earnings.....	\$194,099 51	\$130,088 16	Inc. \$64,011 35	49.2
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Gross earn. per mile.....	\$3,417	\$3,014	Inc. \$403 13.4	
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Net " ".....	1,386	929	Inc. 457 49.2	
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Percent. of expenses.....	59.43	69.17	Dec. 9.74	14.1
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The Treasurer's account shows payments of \$110,435.69 for interest on funded debt, \$3,494.67 other interest, and \$18,118.16 for taxes. The balance on hand Feb. 29 was \$6,258.71.

The increase in tonnage is largely due to improved connections, especially with the Alabama & Chattanooga, the troubles of that road having for several years previously practically closed it to traffic between Meridian and York.

The Superintendent reports the road in poorer condition than it was the previous year, owing to the rainy season beginning two months earlier than usual, and to the extra work required at the Big Black River, which employed all the track force. During the year there were laid 43,690 new ties and 171 tons new rails; 218 heavy and 1,011 light rails were repaired. The heaviest traffic now passes over 35 miles of rails laid in 1839 and 1840 and now 36 years old—believed to be the oldest now in use in America. Very few of these old rails are found fit for repair when taken up, their life being gone. Fourteen of the cuts will have to have new side piling and plankings, or be widened this year. A jetty has been built to protect the road by diverting the current of Big Black River, at a point where there has been always much trouble from washing; the result has been very good. The bridges are all in good condition. Two steam pumps and some small buildings have been put up.

The Land Office reports sales of 1,640 acres of land for \$2,230. An improvement is expected this year.

#### Permanent Way.

At the twenty-fifth ordinary meeting of the session of the Institution of Civil Engineers, held on Tuesday evening, the 23d of May, Mr. Abernethy, Vice-President, in the chair, the paper read was "On the Permanent Way of Railways," by Mr. R. Price Williams, M. Inst. C. E., which is summarized as follows in *Engineering*:

When, ten years since, the subject of the maintenance and renewals of permanent way was discussed at the Institution, steel rails might be said to have been on their trial. In the few instances where they have been used, they were laid rather as an experiment at stations, and in situations where, from the slow speed of the traffic, no risk was incurred of those sudden fractures to which, it was feared, their brittle character rendered them peculiarly liable. Experience had, however, shown that these fears were groundless, and that steel, with the small percentage of carbon used for rails, was a material greatly superior to iron, both in strength and durability, and not more liable to sudden fracture. Steel rails had now almost entirely superseded iron rails on the main lines in this country, and the recent reduction in cost of manufacture would probably lead to steel being used exclusively for rails.

In 1865 the author showed that the average life of iron rails under heavy traffic was then only three years. Since that time the goods and mineral traffic on some of the principal English railways had been doubled, and even trebled. As might be expected, this had led to increased expenditure in the maintenance and renewals of the permanent way, but in nothing like the same proportion—a fact testifying to the more durable quality of the materials. Thus in the last ten years on the Great Northern Railway the tonnage had increased 177 per cent., while the cost per mile of maintenance had only risen 45 per cent.; on the Midland the tonnage had increased 113 per cent., and the cost of maintenance 64 per cent., the chief portion of this latter increase being for materials. On the South-eastern and the London & Brighton lines, the relatively small increase in the cost of labor per mile was observable, but there had been a considerable increase in the cost of staff and office charges.

In 1868, the half-yearly reports of the railway companies were required to be prepared according to a uniform system. The distinction between the maintenance and renewals was then abolished. The cost of maintaining the sidings, points, and crossings, hitherto included in "station works," was charged against "maintenance of way." The author had arranged the tables and diagrams in accordance with this new system. In comparing the cost of maintenance on different railways, it was necessary to take into account the gradients, weight, and speed of traffic in each case, as also the relative mileage of single, double, and triple lines, length of sidings, etc. To afford a common basis of comparison, the author had given the cost of maintenance both per mile of railway and per mile of single line; and much more uniformity was found in the latter than in the former.

The average cost of the maintenance and renewals of the permanent way on the Great Northern Railway during the year 1865, was £124 per mile of single line, the net cost of relaying a mile of single line with iron rails being £1,371. Dividing the latter amount by 124, gave eleven years as the average "money life" at that time; in other words, the annual sum then spent would renew the entire mileage of the railway in that period. In 1875, when steel rails were used, the cost of maintenance and renewals per mile of single line was £184.78, the net cost of

relaying a mile of single line being £1,626, giving a "money life" of only nine years. The "money life" of this permanent way had therefore diminished during the last ten years, a result due partly to the rise in wages, but chiefly to the increased amount of labor in upholding the substructure of the road; indeed, the cost of labor in "maintenance" amounted to four times the labor required for "renewals." On comparing the average cost of the maintenance and renewals of the nine principal English railways, it appeared that on the Lancashire & Yorkshire Railway it was the highest, and that consequently the "money life" was the least, viz., only 6.66 years; the maximum "money life" being found on the South-eastern and the London & Brighton railways, viz., 10.50 and 10.38 years respectively. The average annual cost per mile of single line of the nine railways alluded to during the last ten years, was about £158 per annum, equivalent to an average "money life" of 7.61 years, assuming iron rails to have been used for the renewals. During 1875, the average cost of maintenance of these nine railways had been £213.64 per mile of single line, which, even assuming, as was not the case, that steel rails had been entirely used for renewals, gave only 7½ years as the present "money life" of nearly one-half the railway mileage of the kingdom. The annual cost of the maintenance of the permanent way on these railways represented 2.10 per cent. interest on the ordinary capital, so that one year's increased "money life" would be equivalent to an addition of ¼ per cent. interest on such capital—a fact which showed the importance of the efforts to render the permanent way more durable.

The actual life, or duration, of the permanent way should not be confounded with the "money life," the latter being merely the ratio which the annual cost of maintenance bore to the cost of construction. In the author's previous paper, it was mentioned that some iron rails on a portion of the Great Northern Railway had only lasted 2½ years. The rails which replaced these in 1863, guaranteed for seven years, were not taken up finally till 1870; in the mean time, however, a great portion of them had been renewed, so that the average life was only about 5½ years. The life of rails was entirely a question of tonnage, and of speed and frequency of the trains. Thus on the Loop Line of the Great Northern Railway, from Peterborough to Gainsborough, which was opened in 1848, and where the traffic was much smaller than on the main line, the earliest renewals of the rails occurred in 1868, and only within the last year had the up line been renewed throughout. In the down line some of the original rails were still in the road after 28 years' wear, during which period about 39 million tons of traffic had passed over them. The East Lincolnshire section of the Great Northern Railway was opened the same year as the Loop. Only 21 per cent. of the up line and 4 per cent. of the down line had been renewed, the rails still in the road having a considerable amount of wear in them. The tonnage over these rails had been 13,400,000 and 14,300,000 tons on the up and down lines respectively. During the last ten years 85 per cent. of the mileage of the Great Northern Railway had been renewed, and the average life of the rails was nearly 16 years. With this average life of iron rails, and assuming that sleepers lasted 8 years, the estimated average cost of renewals per annum would be £128.90 per mile of single line, while the actual cost had been £139.55.

Steel rails were first laid on the London & North-western Railway at Camden Town in 1862, and at Crews Station in the following year. Diagrams were exhibited showing the wear and amount of tonnage which had passed over the latter. On an average, it appeared that a wear of 1-16 in. of the tables corresponded to a traffic of 9,370,777 tons. On the Great Northern Railway steel rails were first used at the coal sidings at King's Cross, but the tonnage over them could not be ascertained. In February, 1867, steel rails were laid in the up and down lines in Maiden Lane tunnel. On the down line the traffic was of a heavy character, consisting chiefly of shunting. A diagram was exhibited showing the worn outlines of these rails, the tonnage over them, and the chemical constituents of the steel. The traffic corresponding to a wear of 1-16 in. of the tables varied from 5,251,000 to 31,061,000 tons. Similar diagrams were exhibited, showing the wear, the tonnage and the chemical analysis of steel rails on other portions of the Great Northern Railway. Steel rails were first laid in the running road in 1866-7, on the up line, near Hornsey. A template of one of these rails was exhibited, showing a wear of only 0.15 in. during a period of 9½ years, the traffic having been 66,546,000 tons, equivalent to 27,727,000 tons for every 1-16 in. The proportion of carbon in this rail was only 0.320 per cent. The analyses for this communication were all made by Mr. Riley.

The Metropolitan Railway was opened in January, 1863, as far as Farringdon street, and the extension to Moorgate street in 1865. The greater part of the steel rails had been worn out, and, in some cases, twice renewed, owing to the enormous traffic. The renewals chiefly occurred near the stations, where the brakes attained their maximum effect, that was, intermediate between the points where the brakes were first applied and the station platform. Diagrams were shown of the worn outline of these rails, of the tonnage over them, and also of the chemical analyses of the steel—the most noticeable features being in the case of the rails in the Clerkenwell tunnel, where a considerable difference in the wear was observable in the wet and dry portions of the tunnel, although the amount of traffic was the same.

In a recent paper, the process of hammering the ingot had been recommended in preference to first cogging it, and then rolling it into the finished rail, the latter process having, it was stated, the effect of injuring the metal. The author had had some experiments made at Mr. Kirkaldy's, with a view of practically testing the relative merits of the two systems. The results of these experiments showed, that the rail rolled direct from cogged ingots had decidedly the advantage, being about 2½ per cent. stronger on the average than those rolled from hammered ingots. On the Great Northern Railway rails rolled from "cogged" ingots had endured ten years of the heaviest traffic, and were still in a serviceable condition.

The author had also made experiments as to the relative strength of deep and ordinary fish-plates. The results showed that the average strength of the deep fish-plate was 67 per cent. of the strength of the solid rail, whereas the average strength of the ordinary fish-plate was only 22 per cent. Experiments were likewise made to determine the transverse strength of steel rails, with punched, drilled and partly punched and drilled fish bolt-holes; likewise steel rails which, previous to being subjected to punching, drilling, etc., had been toughened by being plunged in water when hot. It was thus ascertained that the strength of steel rails not subjected to the toughening process, with holes punched cold in the ordinary way, was 65.39 per cent. of that of the solid rail; whereas the strength of the rails with drilled holes was 98.68 per cent., and the partly punched and afterwards drilled rails 97.80 per cent. of the strength of the solid rail. The effect of the toughening process was materially to increase the strength of the steel rails, especially the rails with the punched holes, which showed an increased strength of about 58 per cent. as compared with the untoughened punched rails.

In conclusion, the author expressed a hope that in future steel rails would be made of such uniform quality as would insure, as an average, the maximum endurance already met with in some of the instances referred to—about 30 million tons for a wear of 1-16 of an inch of the tables. With such a quality of material, the average life of a steel rail would be about 300 million tons, equivalent on the most heavily worked portion of the Great Northern Railway to a 42 years' life. The effect of this increased duration would be to reduce the present average annual cost of renewals, viz.: £213 to about £107 per mile of single line.